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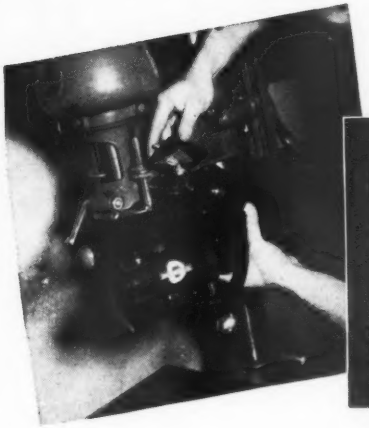

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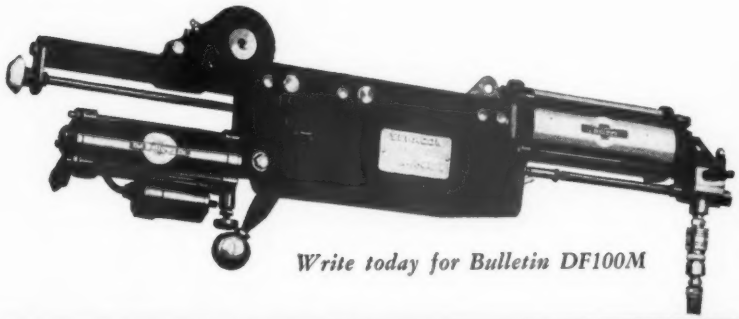

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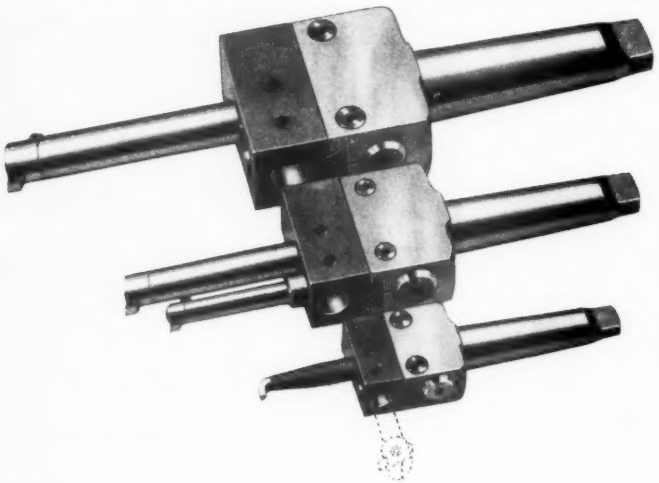

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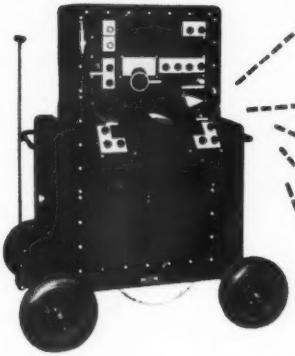
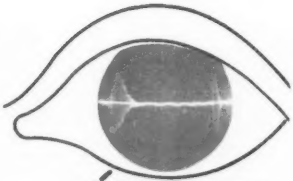
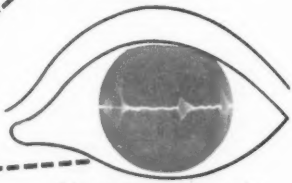
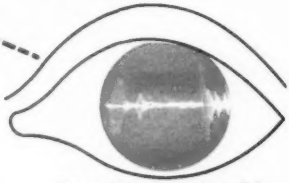




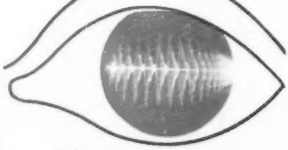
Reflectogram of a piece passed — no flaws.



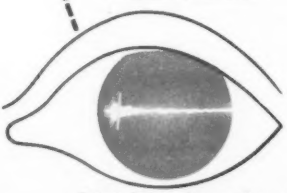
Rejected piece — crack or void angular to face of searching unit.



Rejected piece — crack parallel to face of searching unit, and high degree of porosity throughout.



Reflectogram of heavy plate containing no defects.



Rejected plate—Supersonic waves interrupted by laminations.

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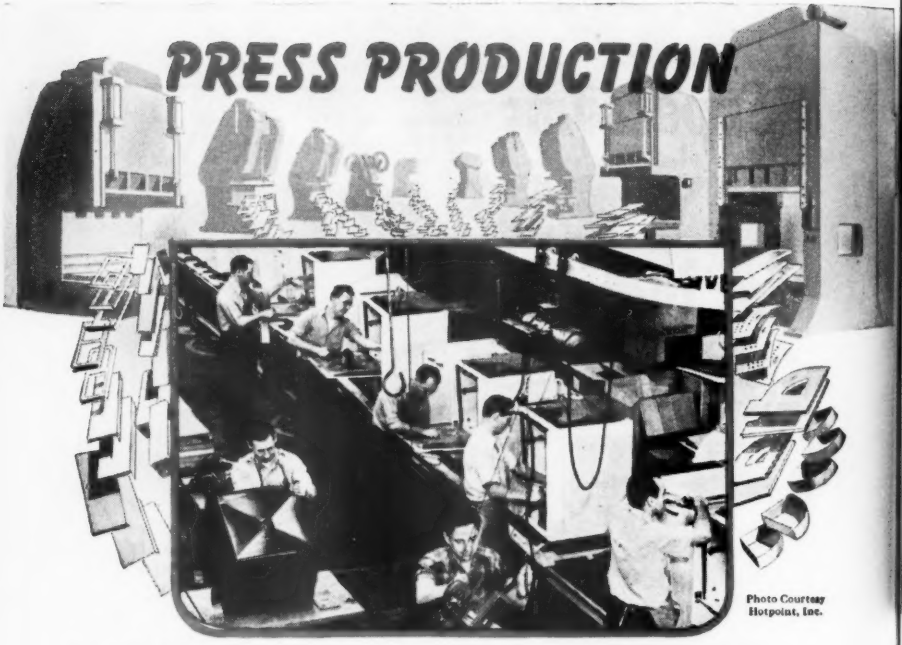

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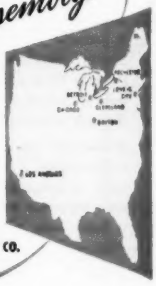

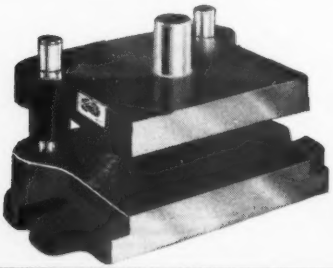

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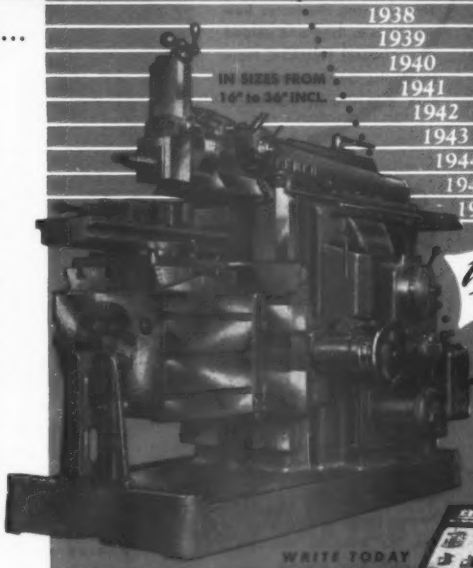

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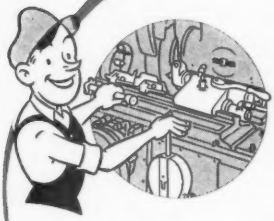
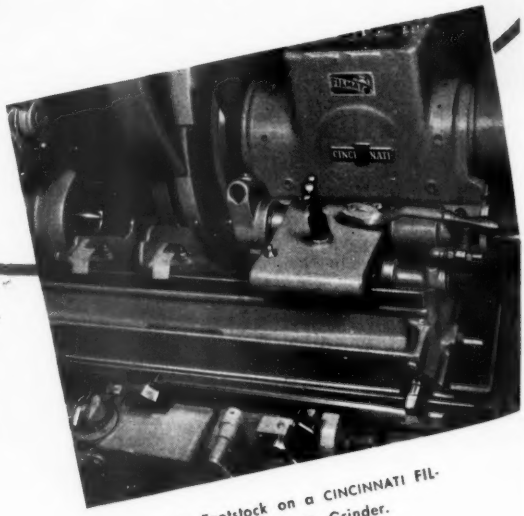
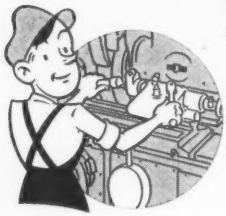


This drawing illustrates how easy it is to load and unload a CINCINNATI FILMATIC Plain Hydraulic Grinder equipped with a Hydraulic Footstock.



Hydraulic Footstock on a CINCINNATI FILMATIC 6" Plain Hydraulic Grinder.



This drawing illustrates how the operator loads and unloads a grinding machine having manual footstock control. He must do this twice for each part ground.

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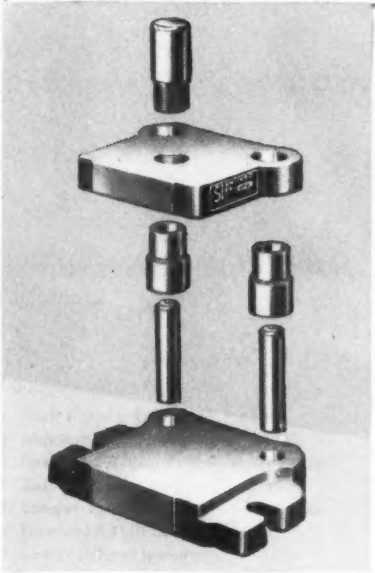

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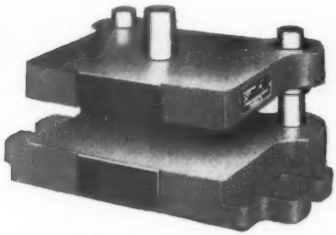

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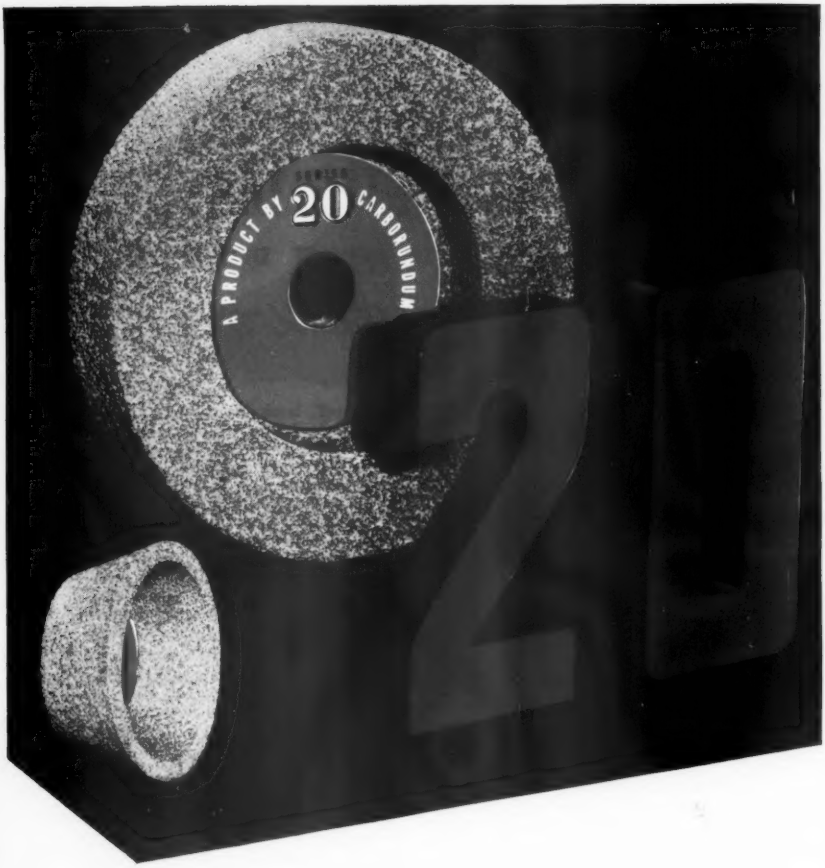
Bridge Machinery Co.
768 St. Paul St. W.
LAncaster 0148

PHILADELPHIA
Fidelity Tool Supply
309 Vine St.
CAmden 4-7765

WORCESTER
Lindco, Incorporated
1023 Southbridge St.
WOrcester 6-4637



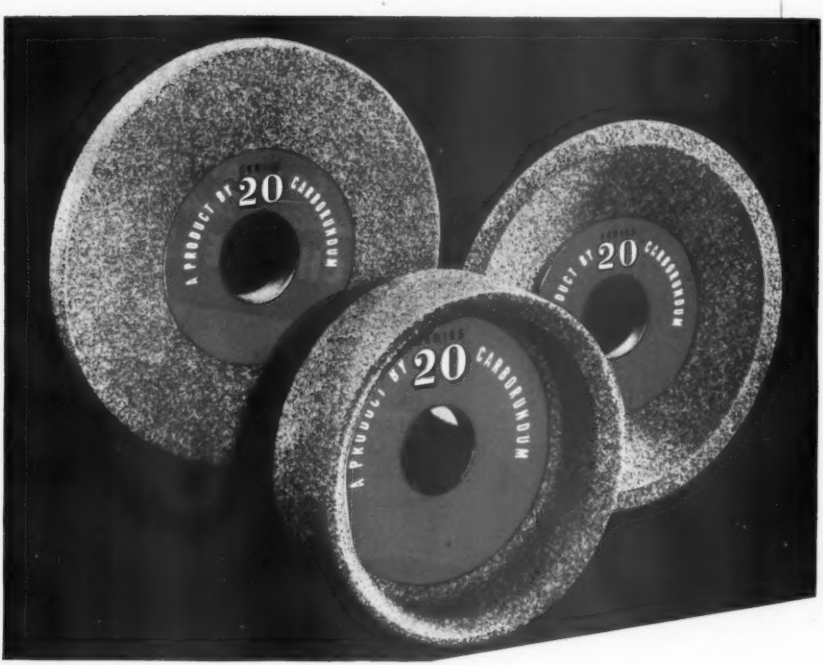
PRESENTING:

"SERIES 20" GRINDING WHEELS

An Important Development by the leading name in Abrasives

CARBORUNDUM

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company



Setting higher standards of grinding while effecting production savings, "Series 20" is now ready. Seven important advantages stand out.

1 **Faster Stock Removal**
2 **Improved Tool Finishes**
3 **Fewer Damaged Tools... Less Scrap**
4 **Cooler Cutting Action**
5 **Longer Tool Life... between grinds**
6 **Increased Skill for Operators**
7 **Lower Wheel Inventory**

A development of our technical laboratories, "Series 20" exceeds all expectations. Tests have been conducted under a variety of conditions in a diverse list of factories. Especially for tool room use, "Series 20" represents one of the most progressive accomplishments of modern abrasive engineering.

In specifying "Series 20", the range of work classifications includes surface grinding, wet or dry operations, tool and cutter grinding and surface form grinding. Standard sizes and shapes are available for specific requirements of modern machine applications and grinding techniques. Because "Series 20" covers a broad range of grinding, actual needed inventory can be smaller.

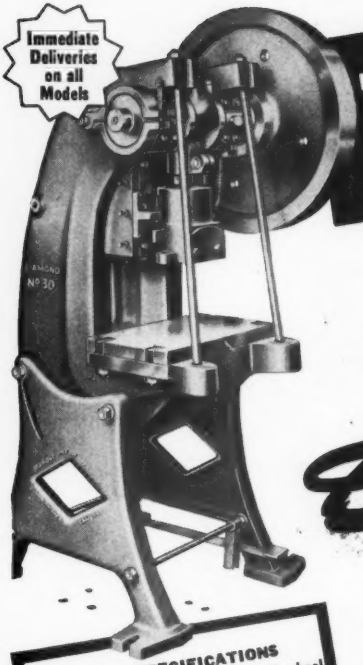
To be sure of the best grading for your specific grinding jobs, we suggest talking it over with one of our representatives. In the meantime, send for booklet "Check List for Better Grinding." The Carborundum Company, Niagara Falls, New York.

A Good Rule for Good Grinding... CALL IN

— CARBORUNDUM

TRADE MARK

Immediate Deliveries on all Models



BY ALL COMPARISON
America's Finest
PUNCH PRESSES

Streamlined, heavy duty types, inclinable for any operating position. High speed operation. Conservative capacity ratings with high overload protection. Highest quality semi-steel castings, precision workmanship. Latest designs and improvements.

Diamond

Open-back, inclinable type

9 - 14 - 30 TON MODELS

QUICK SPECIFICATIONS

Model	Standard Stroke*	Shut Die Height	Bed Area	Flywheel Speed
9 Ton	1½"	7"	6½"x12"	185 max.
14 Ton	2"	9"	8" x15"	150 max.
30 Ton	3"	9"	13" x22"	125 max.

** Longer strokes available upon special order.*

FEATURES

CRANKSHAFT—Chrome nickel steel—precision ground all over. Bearing surfaces finished to 20 micro-inches.

RAM—Bearing surfaces precision jig-ground, hand scraped for individual fit. Exclusive floating-type, fully universal ball screw and nut maintains close alignment over full ram stroke.

GIBS—Precision sliding surfaces ground to 20 micro-inches.

CLUTCH—Positive, instantaneous contact with three sets of pins engaging flywheel.

FLYWHEEL—Extra heavy for smooth operation and maximum energy. Mounted on oversize bronze bushing.

FRAME—Massively constructed semi-steel castings, correctly designed for high overload protection.

On every score DIAMOND punch presses are America's finest... on design...on workmanship...on performance

Write for free circulars. Dealers all over U.S.A.

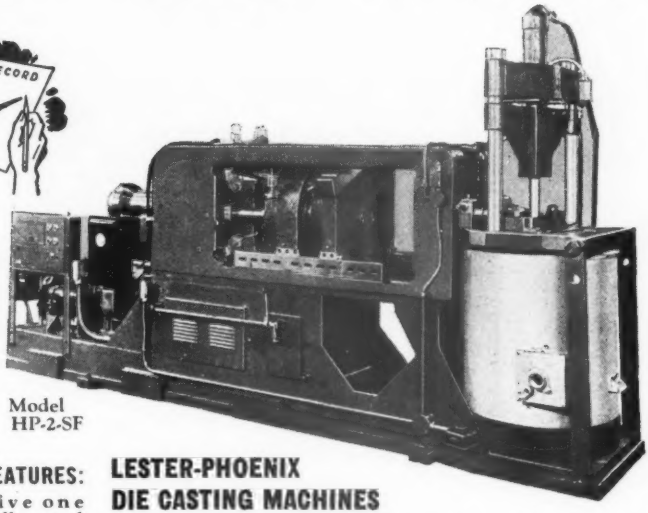
DIAMOND MACHINE TOOL CO.

DEPT. G • 2439 OLYMPIC BLVD. • LOS ANGELES, CALIF.

DIAMOND DTCo

Manufacturers of the DIAMOND Line of Precision Machine Tools and Accessories

IT'S TIME TO *Check* THE RECORD ON DIE CASTING PRODUCTION



Model
HP-2-SF

LESTER FEATURES:

- Exclusive one piece, cast alloy steel frame.
- Exclusive system of toggle linkage transferring entire die locking pressure on the one piece frame through four metal columns.
- Larger, stronger die-height adjusting screw with supporting area equal to die area and single hand crank adjustment.
- Independent control of both injection speed and injection pressure.
- "Slow squeeze" on cold chamber injection, reducing porosity to a minimum.

Write for

Herbert Chase's article of Aluminum die casting.

LESTER-PHOENIX DIE CASTING MACHINES

- This husky LESTER-PHOENIX machine die casts zinc, tin or lead over a projected area of from 200 to 400 sq. in. Zinc capacity is from 4.7 to 11.4 lbs. per shot and the die locking pressure is 300 tons . . . The same machine casts brass, aluminum and magnesium by the cold chamber method when fitted with the exclusive LESTER pre-fill injection system or the standard cylinder. Automatic core pulls may be fitted. Aluminum capacity is from 1.8 to 10.1 lbs. per shot and production is up to 350 shots per hour.
- "Check the record" on die casting production. Compare *your own* requirements with LESTER standard ratings. Let us refer you to customers who have "checked the record" and now operate from 1 to 25 LESTER-PHOENIX machines. If you make or buy die castings, there's a spot in your plant for a LESTER.

LESTER-PHOENIX, INC.

2625 Church Ave. • Cleveland 13, Ohio

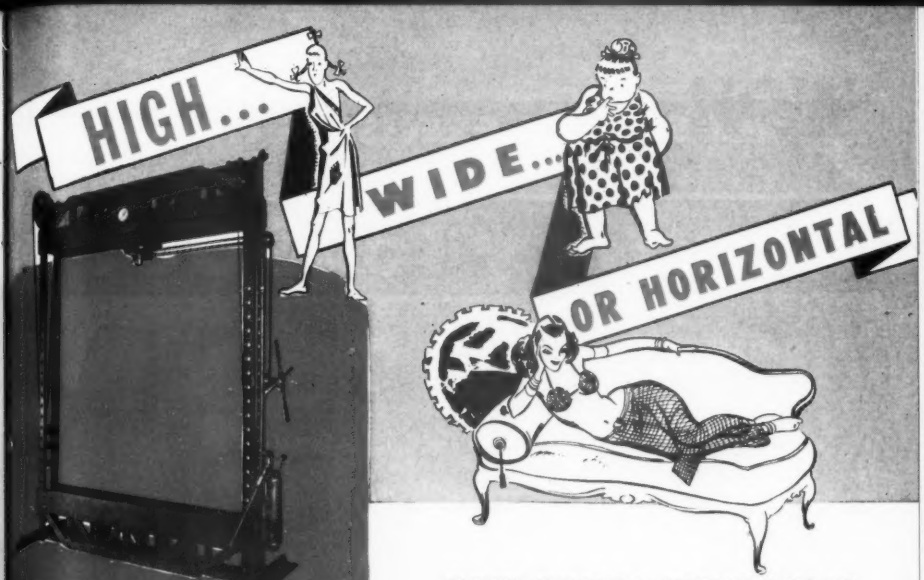
LESTER-PHOENIX
DIE CASTING MACHINES

This difficult operation,—a one-draw, severe reduction, required a correctly designed die with Firthaloy for wear resistance in the hole, and hardened top face for wear resistance against wrinkling.

There's more to a good deep drawing die than simply a carbide insert in a steel casing. Firthaloy engineering skill based on past experience in the deep-drawing field; correct design based on established practice; proper selection of materials; accurate specifications to meet the individual needs of the case . . . are reasons why FIRTHALOY DIES assure size control, surface finish, trouble-free operation, long life and low die cost per piece.

Call **Firth Sterling**

STEEL & CARBIDE CORPORATION



KRW BUILDS HYDRAULIC ARBOR PRESSES TO DO *YOUR* JOB BETTER... DELIVERS THEM FASTER ...SELLS FOR LESS

● While KRW builds a standard line of Hydraulic Arbor Presses, a very large percentage of our production consists of special adaptations such as are illustrated here. These special presses generally cost little more than the standard presses because of KRW mass production methods and the fact that, outside of larger frames, they are built almost entirely of standard components. Any KRW press can be either hand-operated, air-operated or motor-driven, in capacities from 25 to 75-tons. If you are faced with a production problem that might be solved with *any* type of hydraulic press, you can save time and money by telling us your needs. Our hydraulic press engineers will work out a practical solution...without obligation...of course. Mail the coupon.

K. R. WILSON
215 MAIN ST., BUFFALO 3, N. Y.

K. R. WILSON, 215-217 Main Street, Buffalo 3, N. Y.

Please mail me a copy of your Hydraulic Arbor Press Catalog 18

Name .....

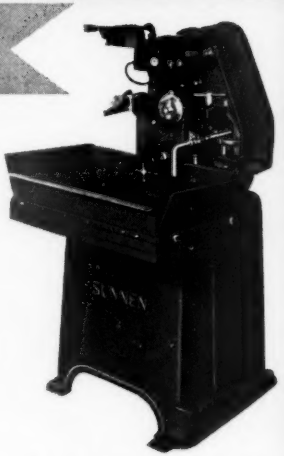
Address .....

City & Zone ..... State .....

With **SUNNEN PRECISION HONING**
You Can Produce Holes with

Accuracy to .0001"

at Low Cost



*U*sed on thousands of parts, the Sunnen Precision Honing Machine finishes parts quickly and more accurately. Parts last longer and there are fewer rejects—even when tolerances are as close as 1 to 2 ten thousandths.

Produces holes straight and true; corrects errors of taper and out-of-roundness; align-hones two or more holes of the same size; accurately duplicates sizes.

To hold very close tolerances on those "difficult" jobs —or produce better than usual finishes—the Sunnen Precision Honing Machine does the job rapidly and economically.

Write for Bulletin XMAN 5000, or ask a Sunnen engineer to call and show you how Sunnen Honing can be used in your plant.

- Size range —.120" to 2.625" in diameter.
- Low in cost—economical to operate.
- Does not require skilled labor.

SUNNEN

SUNNEN PRODUCTS COMPANY

7947 Manchester Ave. • St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

205

The Sunnen Precision Honing Machine is used on parts like these . . .

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

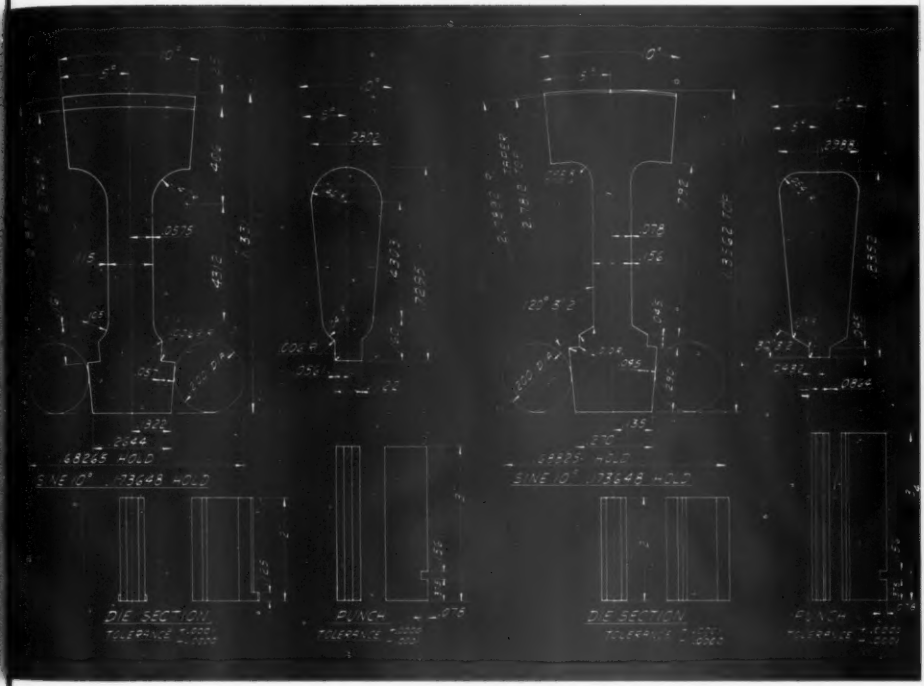
Compressor Yoke. Alignment maintained and better finish produced.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.

Lamination Die Capacity Available **NOW** *for Complete Dies or Sections*



The above drawings of lamination die sections show the close tolerances which we deliver regularly.

Our 27 years' experience manufacturing intricate dies, tools and gages assures you delivery according to specification. No tolerances are too close for our equipment and craftsmen.

We can take your job *now* and guarantee early delivery.

BUILDERS OF PRECISION TOOLS — GAGES • • JIGS • • FIXTURES

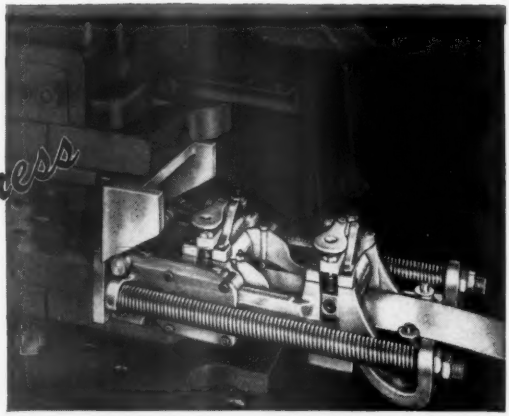
TOOLS *and* GAGES

INCORPORATED

3112 EAST 63rd STREET • CLEVELAND 4, OHIO

MICHIGAN 7230

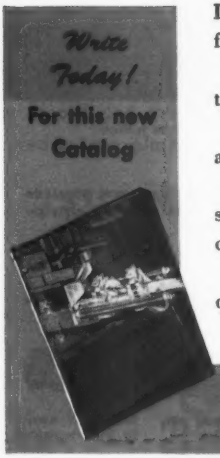
Replace Worn Punch Press Feeds



with the
New Improved

DICKERMAN DIE FEEDS

at Considerable Savings



Dickerman Die Feeds cost much less than old-fashioned feeds and do more accurate, faster work.

They are interchangeable — can be mounted on any type punch press.

Their flexibility allows for feeding stock from any angle — front, back, left and right of punch press.

Maintenance expense is negligible due to the absence of wearing parts, also their accurate and rugged construction.

Send for free illustrated catalog today and get acquainted with profit-making Dickerman Die Feeds.

H. E. DICKERMAN MFG. CO.
323-63 ALBANY STREET • SPRINGFIELD, MASS.

KELLER WORK

The finest, most modern Keller equipment available has been added to the list of superior facilities at STAR Machine & Tool Co. This is the largest Keller machine in a Contract Tool & Die Plant in this area. A new large tryout press has been installed that will accommodate the dies produced on our Keller.

Redesigning and retooling programs are under way—STAR can expedite your tooling at reasonable cost. We have a complete service in the designing and building of Tools, Dies, Jigs, Fixtures and Gages plus our ability to design and build special machinery to meet your requirements. Profit by our many years experience . . .

Write us today and include blueprints for a prompt quotation and dependable delivery schedule.

Founded in 1902

STAR ★
MACHINE & TOOL COMPANY

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Custom Tool and Die Makers

DESIGNERS AND MANUFACTURERS
OF DIES • JIGS • FIXTURES • GAGES
SPECIAL MACHINERY

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Profitable—NORBIDE GAGES
NORBIDE Gages — made of Norton Boron Carbide, "the hardest material made by man" — always prove profitable because they outwear conventional types of gages 100 times and more.
NORBIDE Gages will not scratch, pick up lint nor become charged with particles of metal.
Norton Boron Carbide is lighter than aluminum and NORBIDE Gages are lightweight, easy to use. For the longest-wearing gages ever made ask your regular supplier about NORBIDE Gages, or for further information write to:
NORTON COMPANY
Worcester 6, Massachusetts

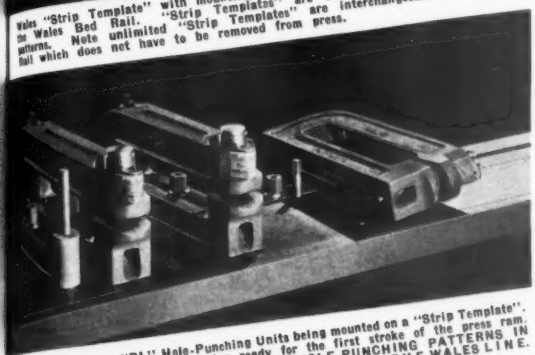
Nothing can be

WHAT ~~COULD BE~~ SIMPLER FOR HOLE PUNCHING

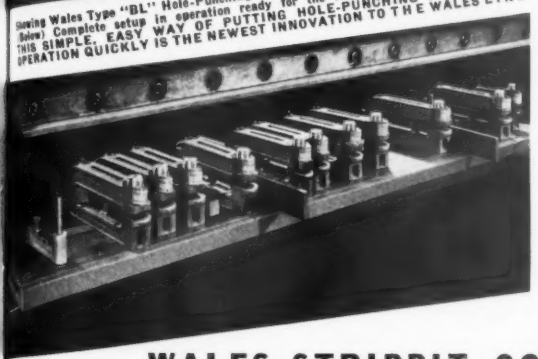
THAN THE **WALES** *patented* AND

EXCLUSIVE TEMPLATE MOUNTING METHOD*

Wales "Strip Template" with mounting holes showing relationship of template to the Wales Bed Rail. "Strip Templates" are combined mounting plates and patterns. Note unlimited "Strip Templates" are interchangeable in same Bed Rail which does not have to be removed from press.



Showing Wales Type "BL" Hole-Punching Units being mounted on a "Strip Template". Below: Complete setup in operation ready for the first stroke of the press ram. THIS SIMPLE, EASY WAY OF PUTTING HOLE-PUNCHING PATTERNS IN OPERATION QUICKLY IS THE NEWEST INNOVATION TO THE WALES LINE.



one important application is in combination with...

WALES Type "BL" HOLE PUNCHING UNITS

● *Only Wales Hole Punching and Notching Equipment has this simple setup method* that provides these NEW money-saving and time-saving advantages.

Wales Patented Mounting Method requires *only one template.* This template serves the dual purpose of being a combined mounting plate and pattern. Faster setups, almost complete elimination of press "down time", and easier storing of templates and mounting plates are *economies not to be overlooked by today's cost-conscious Production Executives.*

Tooling with Wales Equipment is reduced to a simple, quick assembly operation. Also the same group of Wales Hole Punching and Notching Equipment may be used and reused in an unlimited number of setups.

THE SIMPLICITY AND ECONOMIES OF WALES EQUIPMENT IS TOO BIG A STORY TO TELL ON THIS PAGE SO *WRITE FOR FULLY-ILLUSTRATED, FUNCTIONALLY-COLORED CATALOG.*

**Note:* The Wales-Strippit Corporation has not granted permission to anyone to use this patented mounting method *except with Wales Hole Punching and Notching Equipment.*

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, President

355 PAYNE AVENUE, NORTH TONAWANDA, N. Y.

WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

Results ARE WHAT COUNT!
CLE-FORGE HIGH SPEED DRILLS
TRADE MARK REG. U.S. PAT. OFF.
produce more holes per grind
Telephone
YOUR
D
DISTRIBUTOR
S
SUPPLY
T
INDUSTRIAL
The CLEVELAND TWIST DRILL COMPANY
CLEVELAND 14
CLEVELAND
DISTRIBUTORS EVERYWHERE
ARE READY TO SERVE YOU

Illustration of die milling by courtesy of the Bischof Die and Engraving Company of Racine, Wis.

BUT... GORTON Tracer Controlled Milling DID THE JOB

A Gorton Super-Speed Tracer-Controlled Milling Machine with adjustable ram together with a super-speed spindle made it possible to mill to a depth of ½" with a 1/16" dia. cutter (producing thin wall in finished die casting; see arrow). This was for the main frame for a vibrating hand massager manufactured by the John Oster Manufacturing Company of Racine, Wis. Only one Master model was used to mill a two-cavity die casting die with a minimum of hand finishing—this is typical of Gorton Tracer-Controlled equipment.

If you are interested in die and mold work, production profiling, super-speed milling, engraving, graduating, contour grinding or electric etching of hardened parts, let . . .

GORTON PRE-DETERMINE RESULTS FOR YOU

Mail us complete description with prints of your job. Gorton engineers will furnish you with a production estimate of it tooled on a Gorton—no obligation.

THE JOB IN BRIEF

- *Job:* Mill 2-cavity die casting die from single soft master.
- *Material:* Hot formed die steel.
- *Machine:* Gorton 8½-D Super-Speed Duplicarne.
- *Method:* Two machine settings per cavity without resetting work.
- *Cutters:* Gorton single flute; minimum dia., 1/16"; maximum depth of cut, ½".
- *Spindle Speeds:* Roughing, 250 r.p.m.; finishing, 6000 r.p.m.
- *Limits:* .002" with minimum hand finishing.

PLEASE SEND WITHOUT OBLIGATION
Bulletin No. 1655-1206

Name.....
Company.....
Position.....
Address.....
City.....Zone....State.....

Send for Bulletin 1655 on Tracer Control—use handy coupon at right—today!

GEORGE GORTON MACHINE CO.
Tracer Controlled Milling
1206 RACINE STREET • RACINE, WISCONSIN, U. S. A.

When you need our help in a hurry—DON'T WRITE, PHONE Jackson 417.

AIDS TO BETTER PRODUCTION

INDESTRUCTIBLE!

NUPLA MALLETS

A Mallet for Every Purpose and a Purpose for Every Mallet.

- NO MARRING
- NO CHIPPING
- NO REBOUND
- NON-INFLAMMABLE
- HARD-HITTING

WHEN ORDERING, PLEASE SPECIFY WHETHER

→ SOFT (Type XX) — MEDIUM (Type A) — HARD (Type B) ←

STANDARD (ALL PURPOSE)

No.	Head Dia.	Head Length Overall	Approx. Weight
50	1″	3 3/8″	5 oz.
51	1″	3 3/8″	8 oz.
52	1 3/8″	4″	8 oz.
53	1 3/8″	4″	17 oz.
54	1 7/8″	4 3/8″	15 oz.
55	1 7/8″	4 3/8″	24 oz.
56	1 7/8″	4 3/8″	32 oz.

HEAVY DUTY

No.	Head Dia.	Head Length Overall	Approx. Weight
57	1 7/8″	4 3/8″	2 lbs.
58	1 7/8″	5 1/4″	1 1/4 lbs.
59	1 7/8″	5 1/4″	1 1/2 lbs.
60	1 7/8″	5 1/4″	3 lbs.
61	2 3/8″	5 1/4″	1 3/4 lbs.
62	2 3/8″	5 1/4″	3 lbs.
63	2 3/8″	5 3/4″	4 lbs.
64*	3″	6 1/4″	3 lbs.
65*	3″	6 1/4″	6 lbs.

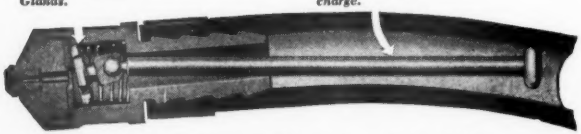
*No. 64 and 65 have removable tips

AIR GUNS

THE ONLY AIR GUNS WITH ENCLOSED LEVER CONNECTED TO THE VALVE BY A BALL AND SOCKET JOINT.

Valve completely enclosed. Eliminates Packing Glands.

Slight movement of lever gives complete discharge.



Features that make it the choice of the most modern plants—

- Leakproof.
- Instant, Positive Shut-Off.
- Low Maintenance.
- Streamlined to Hose.
- Simple Design.
- For Air or Water.

PROMPT DELIVERY

Write for Literature

PRECISION PRODUCTION TOOLS

ACME TOOL COMPANY

96 WARREN STREET • NEW YORK 7, N. Y.

EFFECTIVE
JUNE 1st, 1947

WEBBER GAGE
84 BLOCK SET–84A
±.000004"

~~$350~~ $295

EFFECTIVE NOW
84 BLOCK SET — 84B
±.000008" ACCURACY
$195.00
(Formerly $235.00)

Carblox
WEAR GAGES

Webber Carblox wear gages are specifically designed to permit frequent use of master gage blocks without exposing them to excessive wear. The hard carbide surface of Carblox withstands daily use for many months with virtually no wear. $21.50 for a set of two (.100") with case.

The refinements and dimensional controls introduced by Webber during the war are paying off in lower gage costs today.

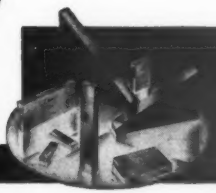
There is no compromise with quality here. Accuracy, dimensional stability, surface finish and wear are the same as currently being employed by Webber users in thousands of shops from coast to coast.

The new price places precision within reach of many shops who have heretofore relied on less accurate means of measurement.

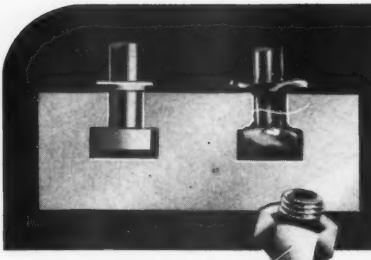
WEBBER GAGE CO.
12903 Triskett Road Cleveland 11, Ohio

WEBBER MAKES PRECISION GAGE BLOCKS EXCLUSIVELY

★ Gage Block Sets in Steps of .00005"
★ Individual Special Size Blocks.
★ Heavy Duty Gage Blocks.
★ Angle Gage Blocks in Steps of one second.
★ Carblox (Carbide) Wear Gages.



Webber
PRECISION
GAGE BLOCKS



Protect This VITAL PART of Your Machines!

NUT of alloy steel, heat treated with Class 3 fit thread, and washer face commercially square with threads.
WASHER heat treated steel, chamfered edges. Ground to uniform thickness and hardened.
THREADS Class 3 fit.
SHANK ground for accuracy.
HEAD Machined square with shank. Square, flat surface of head fits machined surface of T-slot.

It is cheaper to use precision made bolts than to repair expensive machines. Poorly made bolts of soft steels can quickly ruin the accuracy of a machine.

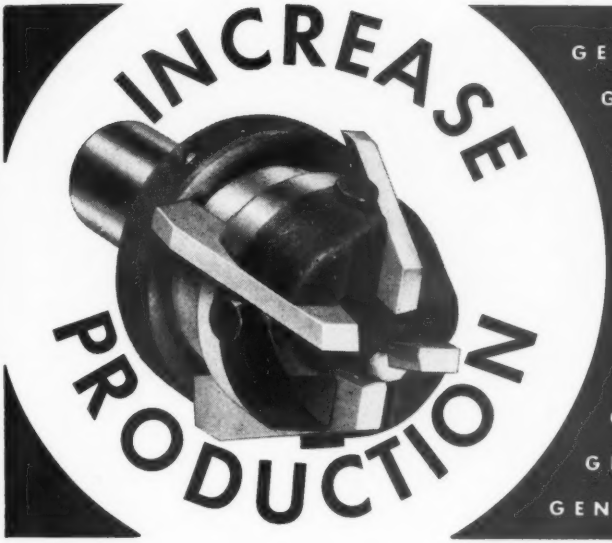
Boyar-Schultz S. M. B. Bolts are made to protect the T-Slot. They are precision made from upset alloy steel forgings and threaded for a Class 3 fit. Use S. M. B. Nuts and Washers with S. M. B. Bolts for firm, delicate adjustments. They hold work in exact position for heaviest machine cuts.

BOYAR-SCHULTZ
Copper Head Laps

Economy and accuracy are the outstanding features of Copper Head Laps. They work rapidly. Only the replaceable copper sleeves wear out. Sleeve adjustment permits maintaining correct lapping size till worn out when it is replaced with a new one. Save costly tool room time. Available from stock in standard sizes, 1/8" to 2 1/2" Diameters.

BOYAR-SCHULTZ CORPORATION

2112 WALNUT STREET **CHICAGO 12, ILLINOIS**



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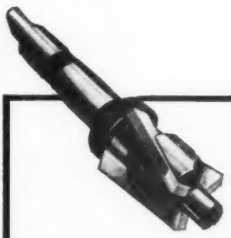
ADJUSTABLE HOLLOW MILLS



There is a Genesee for every hollow milling job. Available in 16 styles. Standard sizes from 0 to 2", with straight or Morse taper shanks carried in stock . . .

- Each size tool has ⅛ range.
- Blades quickly ground in a simple fixture.
- All tools manufactured of heat-treated alloy steel.
- Adjusting threads are ground from the solid and adjusting rings are lapped for extreme accuracy.
- Furnished with high speed steel, cast-alloy, or Tungsten Carbide tipped blades.

Let our Engineering Department solve your Production Tool problems.

Other Genesee tools that will increase production.

•

Inserted Blade FACING AND COUNTERBORING TOOLS

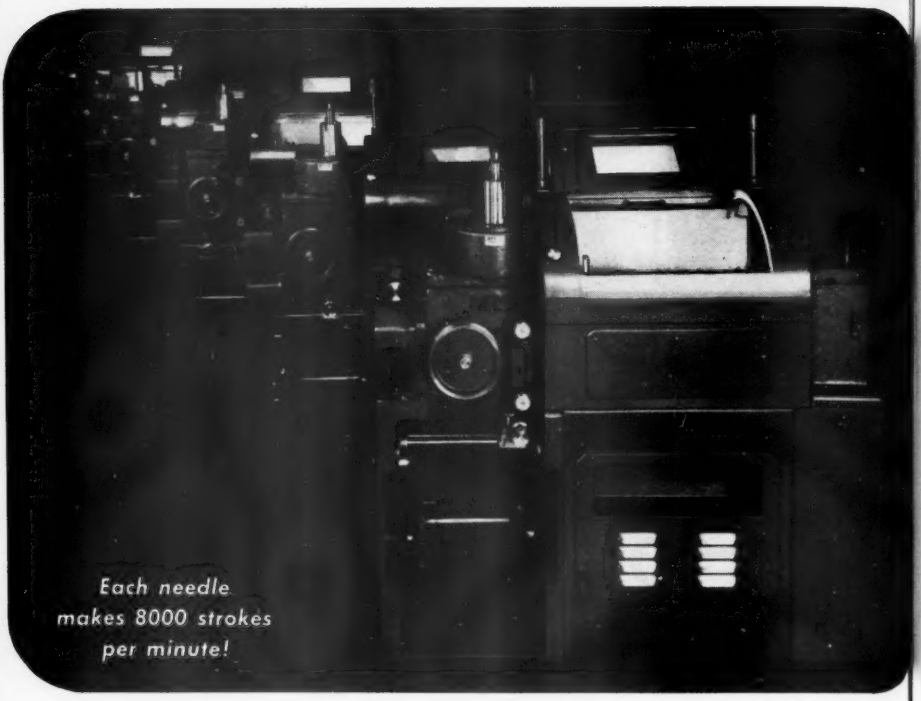
•

SPECIAL PRODUCTION TOOLS

GENESEE MFG. CO., INC.
GENESEE
EST 1908
ROCHESTER 4, N.Y.

Write for catalog 45-J

ADJUSTABLE HOLLOW MILLS • FACING AND COUNTERBORING TOOLS • SPECIAL PRODUCTION TOOLS



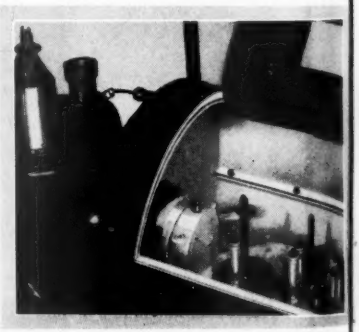
BARTH-BUILT *Special Knitting Machines*

produce electric cables having maximum flexing characteristics

THESE VERY UNUSUAL, precision knitting machines of which a battery of nine have been built by Barth in recent months, knit a seamless tubular sleeve around a group of flexible wires. (Note: Barth does not build standard knitting machines).

In this machine, a group of small needles, visible at the extreme left of the close-up illustration, flash up and down at a rate of 8000 strokes per minute while rotating at a speed of 2000 RPM.

Helping industry maintain its world leadership in production is a Barth objective which has prompted many industrial leaders to take advantage of Barth's complete production, engineering and designing services. Write for catalogue.



BARTH STAMPING & MACHINE WORKS Inc.

Denison at W. 34th St., Cleveland 9, Ohio

DESIGNERS AND BUILDERS OF DIES, TOOLS AND SPECIAL MACHINERY

MULTIPRESS Versatility
will boost your production

RAPID CHANGES from one operation to another with a minimum loss of operating time—you'll find this an important feature of Multipress adaptability. Using a special die-adapter on the Multipress ram, die change time can be reduced to *as little as five minutes!* Your production is never slowed up by prolonged "down time."

Bench-size models in 4, 6 and 8 ton capacities, plus the new 75-ton floor model, offer a wide choice of manual and automatic controls of tonnage, speed and cycling—adaptable to almost any type of production job. Standard Multipress accessories include benches, side shelves, worktable extensions and a variety of bolster plates—plus accessory tooling for numerous other special operations.

Our new, colorful 28-page booklet, "Multipress, and How You Can Use It," is packed with on-the-job data and stories of Multipress accomplishments.

The DENISON Engineering Co., 1197 Dublin Road, Columbus 16, Ohio

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DENISON EQUIPMENT for APPLIED HydrOILics

BLANKING

FORMING

STRAIGHTENING

PUNCHING

CRIMPING

DRAWING

TRIMMING

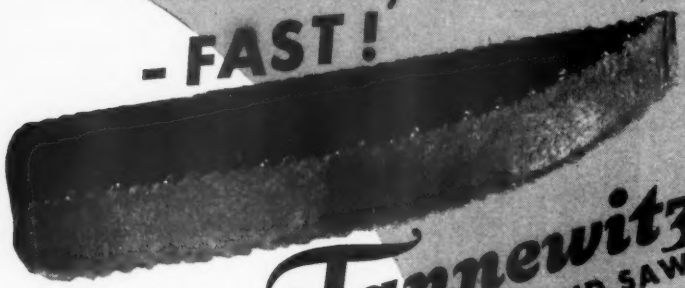
PREFORMING

BROACHING

FOIL-MARKING

PELLETING

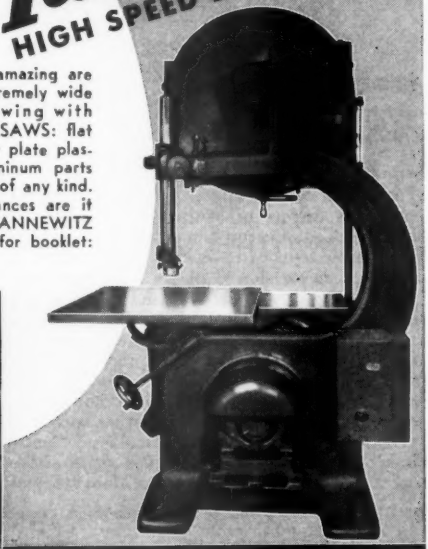
for Sawing **METAL** *as* **HARD** *as a* **FILE**
or Trimming **FORMED PARTS**
- FAST!



Actual photo of file friction sawn on Tannewitz High Speed Band Saw.

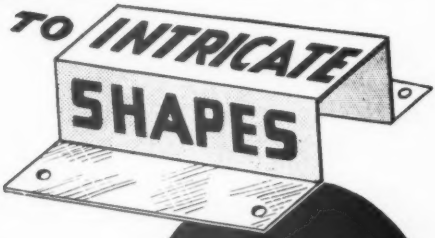
Tannewitz
HIGH SPEED BAND SAWS

Cost reductions that are downright amazing are effected in the cutting of an extremely wide variety of materials by friction sawing with TANNEWITZ HIGH SPEED BAND SAWS: flat sheets, hardened or soft steels, armor plate plastics, and many others. Formed aluminum parts can be trimmed without using a rest of any kind. Whatever your cutting problem, chances are it can be done faster and better with TANNEWITZ HIGH SPEED BAND SAWS. Write for booklet: "FRICTION SAWING."



THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

from FLAT SURFACES TO INTRICATE SHAPES



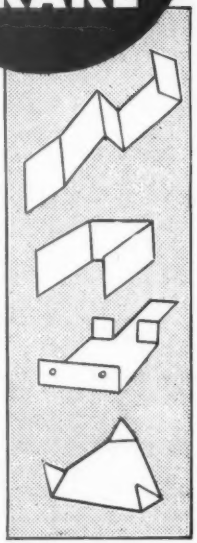
with the New

DI-ACRO BRAKE

- **ROK-LOK**—new sensitive material clamp increases accuracy
- **DOUBLE-EDGED FORMING BLADE** allows close reverse bends
- **NEW PRECISION STOPS** accurately control angularity of bends

This versatile metal forming machine was developed for use in model shops, experimental laboratories and production departments where it often replaces dies for all types of precision forming operations. Di-Acro Brakes will form a great variety of materials including copper, bronze, stainless steel, aluminum and bi-metals.

WRITE FOR CATALOG. New edition of 40-page Di-Acro Catalog contains detailed information on all Di-Acro Brakes, Shears, and Benders and illustrates how these precision machines can be used individually or cooperatively for "DIE-LESS DUPLICATING".



← DI-ACRO is Pronounced "Die-Ack-Ro"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

315 8TH AVE., LAKE CITY, MINNESOTA

Check with BUNELL

for Metal Cutting and Forming

- *Any Work of Almost Any Size*
- *For Any Industry and Almost Any Purpose*

Bunell builds special machines, tools, dies, jigs, gauges and fixtures, and is prepared with 175 machines, competent technicians, experienced craftsmen, and modern plant, to meet your every requirement for designing and building—whatever it is and wherever you are.

The BUNELL MACHINE and TOOL COMPANY

1601 East 23rd Street • CHerry 0343 • CLEVELAND 14, OHIO

• **Representatives for Special Machines:**

State Machine Tool Company
1441 North Third Street
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Triplex Machine Tool Corp.
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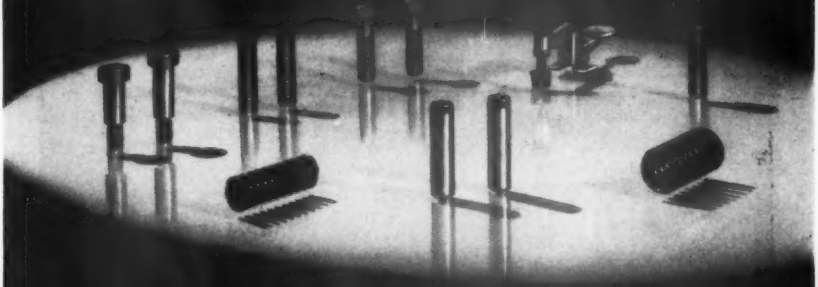
Use "Detroit" Accessories for Dependability



These assembly items are known throughout industry for their quality and precision.

For quick service draw on our large stock of Dowel Pins (163 Standard sizes plus oversizes), Springs, Socket Head Cap Screws, Stripper Bolts, Set Screws and Toggle Clamps.

Standard and Special Die Sets in all sizes.

CALL "DETROIT"

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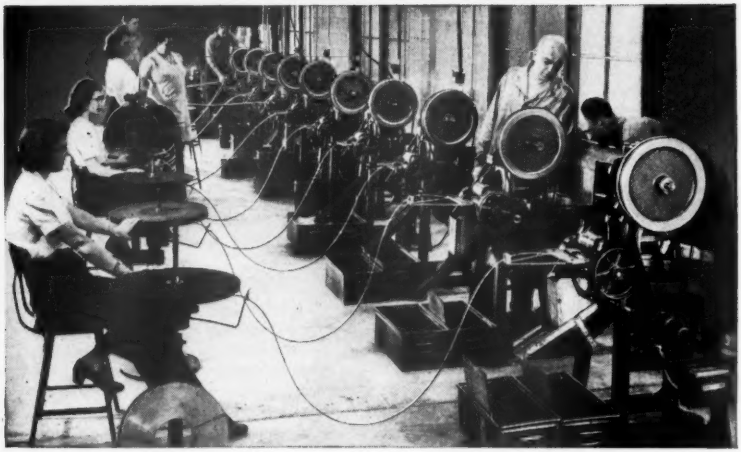
DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SETS ★

PRODUCTION PLUS!

OVER a million stampings per day with this battery of DIEBEL Hi-Speed 550 R.P.M. AUTOMATIC PRESSES



THESE 10 PRESSES OCCUPY ONLY 12 FT. x 45 FT.

The speed of this automatic press—it's adjustable up to 550 strokes per minute!—has resulted in soaring production records over a period of years in hundreds of plants. Diebel Hi-Speed Automatic Presses, like those above, have performed wonders on steel, brass, phosphor-bronze, fiber, plastics, rubber and paper.

May we send you our illustrated circular? It's yours for the asking—an introduction to the solution of your light blanking and forming problems.

DI MACHINE CORP.
DIVISION OF DIEBEL DIE & MFG. CO.
2708 West Irving Park Road Chicago 18, Illinois

GAGES WHILE GRINDING

—no stopping to mike the workpiece

Increases production as much as 100%

Gage rides on the work throughout the grinding operation.

Gage lifted out of way while work is placed or removed from machine.

Prevents oversize regrinds and undersize rejects

WHEN your grinding machine is never stopped to check the size of the work in process, your hourly output increases . . . the cost per piece decreases. *That happens when you install a Federal-Arnold Continuous Grinding Gage.*

This gage controls dimensions at the machine *while the work is being ground.* You put the gage on the rotating workpiece and leave it there; you do not hold it on the work; there is no stopping to mike or gage for size.

The operator requires no unusual skill or training; he merely watches the Dial Indicator until the piece is finished. When the Dial Indicator says the work is to size, it is to size.

Attach an Arnold Gage to a grinder and you save many a dollar otherwise lost in scrap. Even on short runs, this saving in scrap and the increase in output pay for your Arnold Gage in a very short while.

This instrument is easily installed; is sturdily constructed to assure long life and continued accuracy. The contact points are made of tungsten carbide.

You can use Arnold Gages to check straight, tapered or splined diameters; widths between or over shoulders; combined diameter and width. Write us for illustrated Bulletin No. 47.

FEDERAL

FEDERAL PRODUCTS CORPORATION
1144 Eddy St., Providence 1, R. I.

● Dimensional Dial Indicators and Indicating Gages—mechanical, electronic, air, multi-dimensional • Automatic Sorting • Dimensional Machine Control • Combinations of these methods • For the Mechanical, Textile, Rubber, Paper and all industries requiring dimensional accuracy.

HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

for Rapid, Accurate Work in Tool Rooms, Laboratories and Development Departments

The problem today is to produce parts to exacting close tolerances at low cost. The DV 59 Hardinge High Speed Precision Lathe has the perfect combination of accuracy and speed together with rugged construction so necessary for lasting precision. Simplicity of operation enables relatively unskilled operators to produce parts to close limits.

Optical accuracy is now necessary for industry generally — that is why the Hardinge hardened and ground steel dovetail bed construction, standard for special accuracy lathes for the optical industry, is now featured for Hardinge precision lathes. Write for Bulletin DV 59 which presents full particulars about this greatest advance in precision lathe construction.

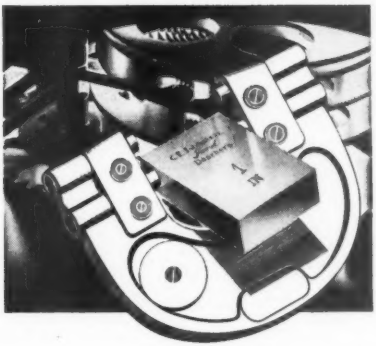
SPECIFICATIONS

1" collet capacity, 9" swing, 17" center distance, 8 spindle speeds up to 4000 r.p.m.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

"JO-BLOCKS" GUARD THOUSANDS OF FAMOUS PRODUCT-REPUTATIONS



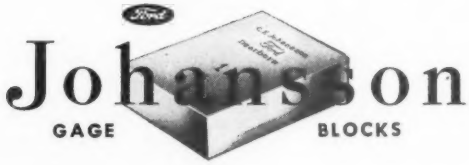
A list of manufacturers using genuine Ford Johansson Gage Blocks would include a high percentage of industrial leaders. And it would include, you may be certain, many who will join the ranks of leadership tomorrow!

For the use of measurement standards of Jo-Block accuracy (2, 4 or 8 millionths of an inch, plus or minus) is a pretty sure indication of determined intent to build a reputation for product-excellence. Order a master set of Jo-Blocks and Accessories for your plant or shop, and encourage your men to acquire working sets for their own tool-kits.

Because we have seen the "magic" which Jo-Blocks can work in fostering honest pride of product, we predict you will be very glad you made the moderate investment. Write for latest literature.

FORD MOTOR COMPANY, *Johansson Division*

3613 Schaefer Road • Dearborn, Michigan



QUICK CHANGE TO SAFETY

with

FOOTHOLD SAFETY TREAD

The previous operator on this radial drill sustained a painful back injury when he slipped and fell on the oily metal floor plate. But this operator won't! Forty minutes and five cleats of Foothold Safety Tread have removed that slipping hazard for keeps.

Easy application and positive non-slip—that's Foothold Safety Tread. Fully effective when wet with water or oil, it prevents falls and speeds footwork because it provides a "sandpaper-rough" surface that *holds*. It is completely waterproof and weatherproof; resists oil, grease, alkalies and mild acids—and can be used *immediately* after laying.

Foothold Safety Tread is provided in roll or cleat form for instant application to any smooth clean floor surface, permitting waste-free "pin-point" application to localized hazard areas on ramps, stairs, aisles and walkways.

Return the coupon for the special "Safety Engineers 12-Cleat Safety Kit"—or write for descriptive booklet, with samples.

BEHR-MANNING
TROY, N. Y.

Please ship special FOOTHOLD SAFETY TREAD KIT containing 12 Standard Cleats 6" x 24". One Quart Foothold Cement and instructions for laying. Price $7.50.

Company Name .....

Address .....

City ..... Zone ..... State .....

By ..... Title .....

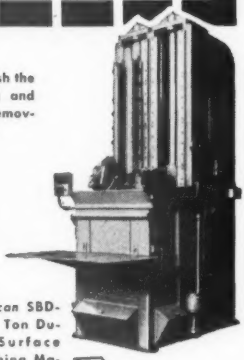
BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.

BEARING CAP SETS BROACHED EN BLOC

This *American* Duplex Surface Broaching Machine is tooled up to broach automotive main bearing caps, producing complete sets for 100 motors per hour.

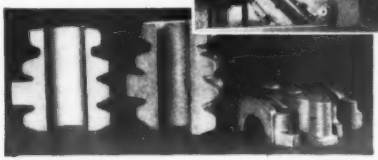
When you are planning metal shaping or finishing work, make use of *American's* complete broaching service—machines, tools, and engineering. You are under no obligation when you SEE *American* FIRST!

Operation at the left is to finish the joint face and bearing lock and semi-finish the half round, removing 1/8 stock on each surface.



American SBD-66-25 Ton Duplex Surface Broaching Machine with tilting type work tables.

Operation at right straddle broaches the two ends of the casting.



Above: Right to left: 1. The rough casting. 2. Ends straddle broached. 3. Joint face, bearing lock and half round broached.

FOR ALL YOUR BROACHING NEEDS—
SEE AMERICAN FIRST

BROACHING TOOL INSTITUTE

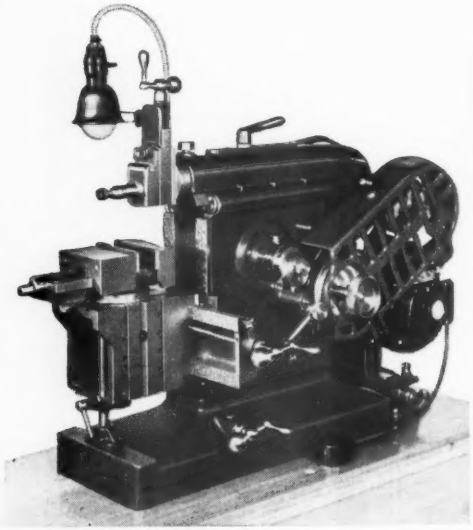
American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF

CUT PRODUCTION COSTS *with* *Low Priced* AMMCO 7" SHAPER



THE
AMMCO
SHAPER
saves on

1. Time
2. Labor
3. Floor Space
4. Electricity
5. Set-up Expense

The Ammco 7" Shaper is a real money saver . . . yet there isn't a big machine that surpasses it in accuracy. Compact in design, low in price, the Ammco 7" Shaper will amaze you with the variety and quality of work it turns out. Its operating expense is remarkably low. The Ammco Shaper is the perfect shaper for 7" stroke or less . . . it comes in bench or portable cabinet models. Write today for specifications and low prices.

Address Department TD-67

AMMCO TOOLS, INC.

COMMONWEALTH AVENUE — NORTH CHICAGO ILLINOIS

SKILL IS BUILT INTO EVERY AMMCO PRODUCT

NEW features that mean Better Tapping

THE "PROCUNIER"
HIGH-SPEED TAPPING ATTACHMENT
SIZE NO. STYLE
CAPACITY RIGHT HAND CAST IRON STEEL
PROCUNIER SAFETY CHUCK CO. CHICAGO, ILL.

This new high speed Procunier Tapping Head is the answer to your toughest tapping problems. It is a precision machine which assures greater tapping accuracy at high speed—with less tap breakage. Check these new Procunier features:

✓ New double-cone cork faced friction clutch engages the conical surfaces of the drive and reverse shells, driving the tap with a soft "cushioned" action.

✓ New clutch instantly "slips" if tap strikes bottom or sticks—reducing tap breakage.

✓ High sensitivity of Procunier Tapping Head makes it possible to quickly detect dull or "loaded" taps by the pressure needed to drive them.

✓ Procunier Tapping Heads have heat treated gear mechanism, ball bearings, lightweight aluminum housings as well as many other advanced features.

New Procunier "Tru-Grip" Tap Holder

Cross section of "Tru-Grip," showing positive drive to tap.

A complete line of Procunier Tapping Heads is available, including Cover Clamping models — write today for illustrated bulletins.

Procunier

Safety Chuck Company

12-14 S. Clinton St., Chicago 6, Illinois

PROCUNIER SAFETY CHUCK CO.
12-14 S. Clinton St., Chicago 6, Ill.

Send me bulletins on

- ☐ Procunier High Speed Tapping Heads
- ☐ Procunier "Tru-Grip" Tap Holders
- ☐ Universal Tapping Machines

Name.....

Address.....

City.....State.....

Meyers Carbide Tipped Formed Tools

For Your *Special* Requirements

On actual production runs, Meyers generated Carbide Tipped Tools have boosted production more than 500%.

This amazing increase was due to use of special Meyers equipment designed and engineered by our Engineering Department. Increased costs force you to get the most out of your machine tools—Meyers generated carbide tipped form tools will give you more pieces per hour—more pieces between grinds—and a much smoother finish. Let us help you improve your production and cut your costs. Send us your prints for quotation.

W. F. MEYERS COMPANY, INC. • *ESTABLISHED 1888*

1016 FOURTEENTH STREET • • • BEDFORD, INDIANA

ON THE LEVEL

you'll save time and money with

Empco JACKS

3 SIZES

No. 1—2" normal height
No. 2—2⅜" normal height
No. 3—3⅛" normal height

POSITIVE, ACCURATE MEANS FOR SETTING AND KEEPING MACHINES LEVEL IN A MERE MATTER OF MINUTES!

Machine Tool Manufacturers strongly emphasize the need, not only to set machines level, but to keep 'em that way. Periodic re-leveling is essential for accurate work tolerances. How often, depends on the type of foundation. No method of machine setting is stable enough to maintain the accuracy of initial leveling. It is important to check after first month of operation, then check periodically and re-level whenever necessary.

When a machine is set on EMPCO JACKS, the whole operation is the work of but a moment: Simply apply a wrench to the "hex" screw head, turn right or left until your level indicator reads "zero."

EMPCO

THE ENTERPRISE MACHINE PARTS CORPORATION

2735 JEROME AVE. DETROIT 12, MICH.

South Bend 9" Precision Lathes

Quality-Built for Quality Work

9" x 3' South Bend
Model A Bench Lathe

FEATURES AND SPECIFICATIONS

SWINGS—9¼" over bed and saddle wings

BED LENGTHS—3, 3½, 4 and 4½ feet

DISTANCE BETWEEN CENTERS—
16 to 34 inches

SPINDLE SPEEDS—
Six—41 to 658 r. p. m.
Twelve—41 to 1270 r. p. m.
Sixteen—46 to 1176 r. p. m.

POWER LONGITUDINAL FEEDS—
Model A Lathes—48, .0015" to .0853"
Model B Lathes—26, .0021" to .0155"
Model C Lathes—14, .0021" to .0156"

POWER CROSS FEEDS—
Model A Lathes—48, .0004" to .0252"
Model B Lathes—23, .001" to .0046"

THREAD CUTTING RANGE—
Model A Lathe—48 pitches, 4 to 224 per inch
Models B and C Lathes—45 pitches, 4 to 160 per inch

MAXIMUM COLLET CAPACITY—½ inch

The quality that is built into South Bend 9" Precision Lathes enables them to produce quality work with efficiency under all conditions. Regardless of the type of machining—between-centers, collet, fixture, or chucking—close tolerances can be maintained and a maximum volume of fine work produced with a minimum of effort.

Write for Catalog 9-J which fully describes and illustrates all South Bend 9" Precision Lathes and attachments.

SPEED PRODUCTION WITH THESE ATTACHMENTS

COLLET ATTACHMENTS	HANDLEVER BED TURRET
TAPER ATTACHMENT	DOUBLE TOOL CROSS SLIDE
MILLING ATTACHMENT	SQUARE TURRET
ELECTRIC GRINDER	CENTER REST
CARRIAGE STOPS	FOLLOWER REST

BUILDING BETTER LATHES SINCE 1906

SOUTH BEND LATHE WORKS

432 EAST MADISON STREET • SOUTH BEND 22, INDIANA

A CASE OF

JIG-LESS

PRODUCTION

BY THE

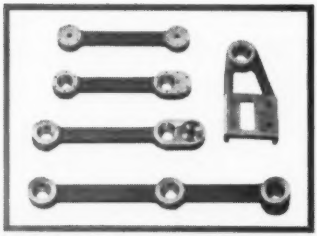
Moore Jig Borer

featuring the New "Eccentric Hole Sizer"

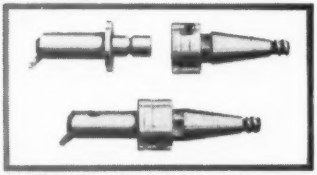
The Problem—100 sets of parts yearly (see top photo), 25 sets per lot...holes approximately 2" in diameter.

The Solution—Produced in Moore Jig Borer at low cost because of minimum special tooling; to tolerances in "tenths," and in "Jig Time."

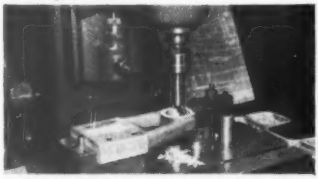
Ideally Suited for jigs, fixtures, dies, machine parts and jig-less production, the Moore Jig Borer is sensitive for holes 1/32" in diameter, yet rugged for heavy cuts up to 4½".



The Parts—Aluminum castings, requiring stock removal, hole location and hole sizing.



New Moore Eccentric Hole Sizer (shown assembled and disassembled)—sets a carbide bit to .00005" (half-tenth) simply and easily. Taper shank allows tool changes in matter of seconds and will repeat hole diameters when single point sizing. Vernier setting of bar permits fine adjustment through a range of .004", plus conventional tool bit adjustment.



In The Moore Jig Borer—Simple fixture holds work. Speed in handling this production problem is due to Moore Jig Borer's wide spindle speed range (to 2,600 RPM), and quick-setting lead screws. The latter are ground to an accuracy of .0002" in 16".

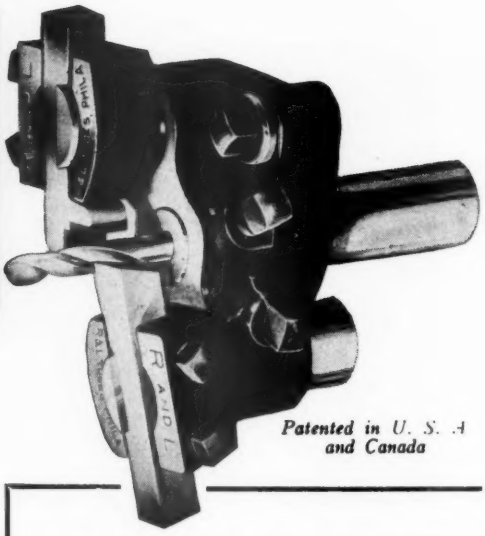
Write today for complete descriptive literature

MOORE SPECIAL TOOL COMPANY, INC., 726 UNION AVENUE, BRIDGEPORT 7, CONN.

MOORE JIG BORER MOORE TOOLS

SPOTS. DRILLS. BORES. REAMS.. WITH MINIMUM TOOL CHANGES

ONE COMBINATION R and L TURNING TOOL *Will Do The Work Of All These For Either Right or Left Hand Operations*



Patented in U. S. A and Canada

- **Roller Box Tool**
- **Centering and Facing Tool**
- **Knee Tool**
- **Pointing Tool**
- **Back Rest**
- **Floating Drill Holder**
- **Balanced Turning Tool**

Fourteen tools are combined in one R and L (right and left) Combination Turning Tool, the only combination right-hand and left-hand tool on the market.

You can change an R and L Combination Turning Tool from right to left or vice versa in a matter of only ten seconds.

YOU WILL APPROVE THESE OUTSTANDING FEATURES

- **Made of extra tough, heat treated alloy steel; unconditionally guaranteed not to bend or give way**
- **Essential parts ground to extreme accuracy affording perfect alignment at any point of adjustment**
- **Back Rests, or burnishers, have almost diamond hard surfaces eliminating metal pick-up and marring of work surface**
- **Interchangeable Roller Back Rests furnished if desired**
- **Precise adjustment on both cutting tool and pressure of burnishers**
- **Tool bits wear longer because they are ground only on top side, or end**
- **Less cross-slide clearance required; saves time and often permits working with cross-slide tools while turning or drilling**
- **On turnings, the R and L Combination Tool produces highly polished surfaces, true to size, and straight**
- **Usable either for roughing or finishing; extra heavy cuts possible because thrust is always in direct line with Back Rest**
- **Longitudinal adjustment permits turning of two diameters to any length within tool capacity**

All these and many other features are shown by photographs in drawings in descriptive booklet mailed without cost or obligation. The booklet illustrates the tool set-up for various operations, and indicates speed and simplicity of its adaptation to various jobs. Prices and full specifications of many available sizes are included. Write for your copy today.

R and L TOOLS

1825 Bristol Street
Philadelphia 40, Pennsylvania

Interchangeable A. S. A. STANDARD PRECISION DRILL JIG BUSHINGS

Speed Up Drilling—Cut Down Costs!

PROMPT DELIVERY of all A.S.A. standards direct from factory stocks at Garwood, N. J. • Stocks of all popular types and sizes maintained at Dayton, Detroit and Stratford • FREE color Catalog No. 446 gives standard bushing sizes, together with price list and other information needed by the tool engineer • Write for it Today.

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*Stock of popular sizes carried at these locations.

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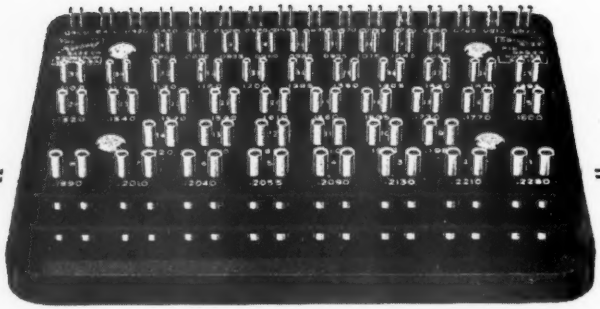


DRILL SIZE PIN GAGES

Class Z Accuracy

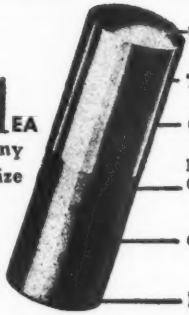
LETTER SET—52 gages in 26 pairs from A to Z. $45 set.

FRACTION SET—60 gages in 30 pairs in steps of 1/64" from 3/64" to 1/2", $50 set.

NUMBER SET — 120 gages in 60 pairs from 1 to 60, $90 set.

All sets include stands . . . Prices F.O.B. Bridgeport, Conn.

$1 EA any size



Sets in pairs of gages for checking any number of similar holes. Stands have 3 plates and cover so that gages stand upright. Drill size is plainly stamped in front of each gage hole, together with decimal equivalent to the ten thousandth of an inch.

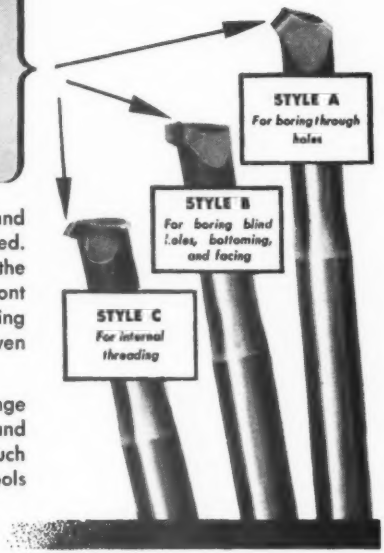
IMMEDIATE DELIVERY — 116 SIZES

Check or M.O. should include .08c postage for quantities less than Set. Sets shipped Express Collect. No C.O.D.'s.

THE *Horberg* GAGE COMPANY

19 STAPLES STREET, BRIDGEPORT 1, CONN.

YOU RESHARPEN ONLY ONE FACE OF BOKUM TOOLS



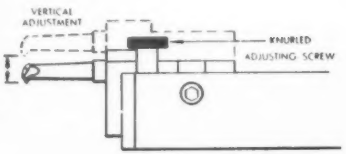
Thus the original form of these boring and internal threading tools is never changed. The angle of the cutting edge and the special helical backed-off form of the front of the tool (A and B) produce a free cutting action that is constantly retained—even through resharpening.

Send for folders that show complete range of sizes. Choose the tool you require and try it on your machines. See how much faster and more economical Bokum Tools perform.

E-1139 gives information on super high speed tools and E-398 on carbide tipped tools.

THIS NEW HOLDER GIVES YOU VERTICAL ADJUSTMENT

A simple turn of knurled screw on top of holder moves tool in vertical plane to give the precision setting you want. Rocker of tool post can be left out and shims are not needed. Here is a worthy advancement in boring tool holders. Two sizes: BT-0 shank size, ⅜" x 1"; BT-1 shank size, ½" x 1¼".



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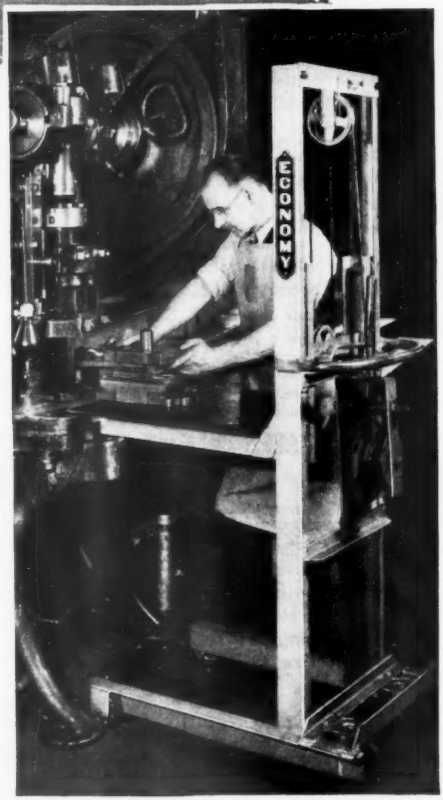
TRADE MARK REG. U. S. PAT. OFF.

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

Save production time with a SHOPLIFTER



- **Light, Compact**
- **Easily Moved About**
- **One-Man Operated**
- **Wide Range in Application**
- **Saves Production Time**

  In handling dies and heavy fixtures; stacking barrels, boxes, etc.; loading and unloading trucks

Specifications

Type—D
Capacity—500 lbs.
Overall height—72"
Platform lift—54" above floor level, lowers to within 5" of floor
Baseframe—24" wide x 33" long
Platform—24" x 24", steel plate
Entire frame of machine of structural steel, electrically arc welded throughout
Basewheels—4" diameter, iron wheels
Crank up and down hoist unit
Two swivel casters and two stationary wheels with push bar furnished
Painted olive green finish
Weight—250 lbs. (approx.)

Heavier capacities up to 5,000 lbs. also available. Write for details.

Prompt Delivery . . . Price $157.50 Full freight allowed

Foot Operated Floor Lock—$10.00 extra

ECONOMY ENGINEERING CO., 2667 W. Van Buren St., Chicago 12, Illinois

Dowel Pins

They serve as locating pins for the die-maker's work — and then go on to general duty as pins and pivots in various machine assemblies.

By their accuracy and strength they *retain* precision standards in tool and die and machine assemblies under punishing stresses.

They are ground to a limit of .0002″ over basic size, with an allowable tolerance of plus or minus .0001″. Surfaces are finely polished; subsequently treated with a rust-preventive.

Metallurgically in a class with ALLEN Hex-socket Screws: — made of the same special-analysis *ALLENOY* steel, heat-treated to an extremely hard surface, with a core of the right toughness to prevent "mushrooming" when driven into a tight hole . . . Tensile strength, 240,000 to 250,000 lbs. per sq. inch. Ask your local ALLEN Distributor for samples and dimensional data.

THE ALLEN MANUFACTURING COMPANY
HARTFORD 1, ★ ALLEN ★ CONNECTICUT, U. S. A.

BOYAR-SCHULTZ PROFILE GRINDERS

Fast, Accurate CONTOUR GRINDING

IN THE TOOL ROOM...IN PRODUCTION

Boyar-Schultz Profile Grinders save time in grinding inside and outside contours, irregularly shaped profiles, die clearances and many other difficult grinding tasks.

Boyar-Schultz No. 2 Profile Grinder
A heavy duty floor model available with single or dual spindles which turn at 10,000 R P M. with vertical oscillations. Rapid stock removal even with wheels as small as ½" diameter. Uses wheels ½" to 3"

Boyar-Schultz No. 1 Profile Grinder
Bench model. Spindle speed of 20,000 R.P.M. with vertical oscillations. Accommodates wheels ⅛" to 1" diameter. A highly efficient tool that performs in minutes, much of the work that formerly required hours.

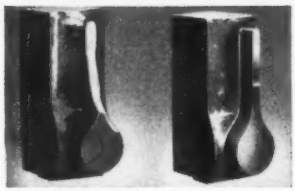
Boyar-Schultz CORPORATION

2112 WALNUT STREET **CHICAGO 12, ILLINOIS**

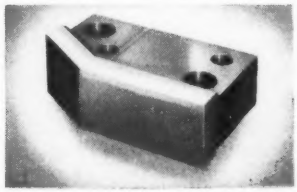
THE PIONEERS

of tool and die WELDING ELECTRODES

. . . can help you save 4 ways



Die unit quickly repaired by welding with Eureka Electrodes. No heat-treat required.



Die unit compositely fabricated with Eureka Electrodes. No heat-treat necessary.

Save many man hours, conserve valuable tools and dies and minimize production delays with the aid of EUREKA TOOL and DIE WELDING ELECTRODES. Here's how it can be done:

1 REPAIRING DIES. . . . Existing units that may fail in operation can be EUREKA welded, either partially or wholly, resulting in a minimum of "down-time."

2 COMPOSITE FABRICATING. . . . Die units can be compositely fabricated, when practical, by EUREKA welding, resulting in numerous advantages.

3 CORRECTING DESIGN. . . . EUREKA welding facilitates making changes in contour, corners or edges during die "try-out" or "change-over" periods.

4 RECTIFYING ERRORS. . . . EUREKA welding permits the correction of errors made in tool and die manufacturing, resulting in great savings.

EUREKA STEEL ELECTRODES FOR TOOL AND DIE WORK

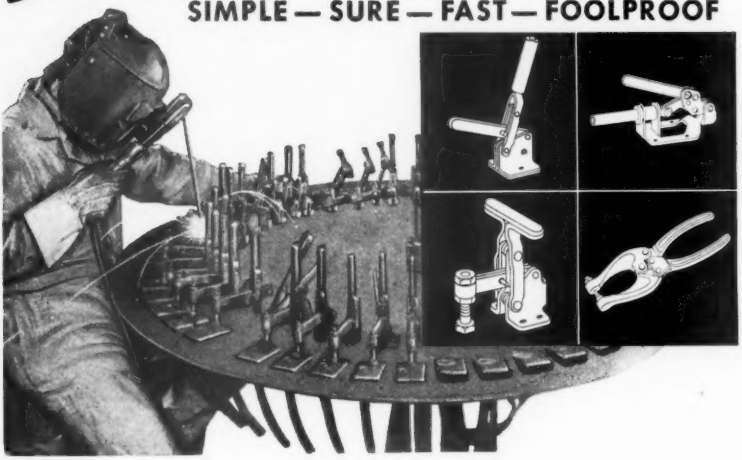
Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

225 Leib Street • Detroit 7, Michigan

SMART TOOLING!

SIMPLE — SURE — FAST — FOOLPROOF



Here's efficient tooling based on the quick action and positive holding power of De-Sta-Co Toggle Clamps. This simple turntable with its 48 No. 210-S clamps enables one welder to keep abreast of two helpers. One places curved shank in socket and unloads finished assemblies. The other locates pierced hole in plate over shank and locks securely with toggle clamp. The expert welder works without interruption.

Smart tooling like this is the backbone of modern mass production technique. You'll see De-Sta-Co Toggle Clamps playing a similar vital part *wherever* the principles of sound tool engineering are observed.

Welding production is *only one* of the many fields for quick acting clamps. For holding parts in milling, drilling, routing, riveting, cementing—for fast, uniform, *foolproof* action—progressive tooling demands De-Sta-Co adaptability and quality. There's a De-Sta-Co clamp for every job, designed and built to stand up under the wear and tear of volume production. Send for copy of Catalog No. 47.

DETROIT STAMPING COMPANY
344 Midland Ave. Detroit 3, Mich.

SPRINGFIELD PRECISION TOOL ROOM LATHE

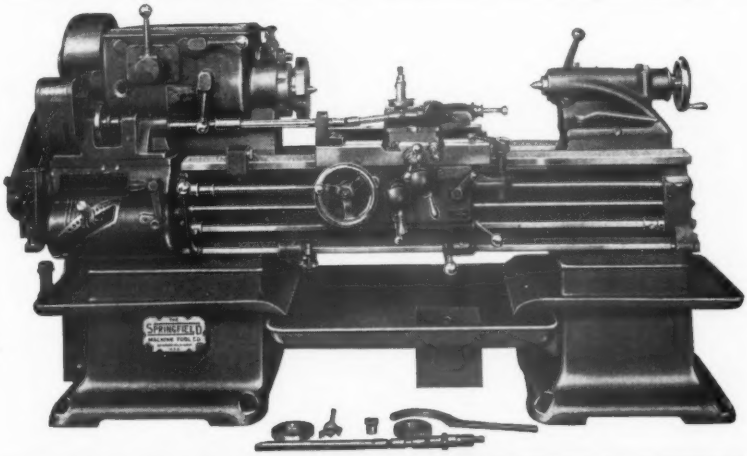
"A Master Lathe for Master Craftsmen"

The Springfield Precision Tool Room Lathe is engineered and constructed to the most exacting requirements. Its superior design features have been developed through more than sixty years' experience in building precision machine tools.

The powerful Headstock provides twelve spindle speeds. No more than seven of its chrome Molybdenum hardened *ground* gears are in mesh at one time. Timken Precision Taper Roller Bearings in solid headstock housings insure permanency of spindle alignment and long life. All bearings and gears are spray lubricated by cooled oil from the large reservoir in the leg.

The semi-steel Apron is of extra-heavy, box construction and is completely ball and bronze bearing-equipped. The Taper Attachment is capable of very fine, micrometer screw adjustment. The sturdy Compound Rest is a heavy duty, square base type providing full 360° swivel. The Tailstock, massively designed, has large centers and exceptionally long spindle travel.

ASK US FOR *YOUR* COPY OF BULLETIN 162 which illustrates and describes the features of the Springfield Precision Tool Room Lathe and gives detailed specifications.

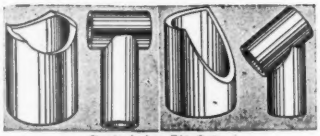


THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

SHEAR TUBING OR PIPE ENDS EASILY WITH

ARC·FIT

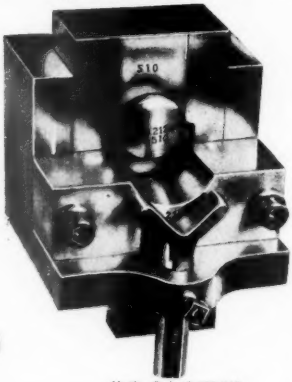


Typical Arc-Fit Cuts

Arc-Fit is a shearing unit for preparing pipe or tubing ends in making welded or brazed tubular joints. Arc-Fit will prepare the ends of a pipe or tube in less than *5 seconds*. Arc-Fit is a production tool that will cut your production costs. It is applicable in any industry where pipe or tubular construction is used.

- **Arc-Fit can be utilized in any power press.**
- **Arc-Fit can be furnished for any size tubing or pipe.**
- **A hand press can be supplied with Arc-Fit units for shearing pipe or tubing sizes 2 inches or under.**
- **Arc-Fit does not deform pipe or tube. No grinding or finishing operation is needed.**
- **Engineers can now design for tubular construction and cut costs.**

Write today for circular and prices.



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VOGEL TOOL & DIE CORPORATION
2527 Moffat Street
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Meth. Pat. 2,126,519

In Brightboy, the abrasive burrs and finishes while the rubber cleans and polishes. Brightboy takes up where grinding abrasives leave off—bridges the gap between the grind and buff.

Your abrasives stock isn't complete unless you have Brightboy on your shelves—ready for the hundreds of uses to which this versatile abrasive can be put. Ask your dealer for the Brightboy Catalog Manual and prices. Write us to have a Brightboy service man suggest methods and production short-cuts.

Why Pay This Much.....

For 3 Operations

BURRING FINISHING POLISHING

When Only This....

Gives You *All In One*... { Burring Finishing Polishing

WELDON ROBERTS Brightboy

BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co. Newark 7, N. J.

THIS IS DUPLITROL . . .

. . . FOR MAKING REPETITIVE PARTS *WITHOUT JIGS!*

2 ¾ x ¾ C.R.S. **BARS** *ONE* HORIZONTAL *ONE* VERTICAL . . . with ¼" holes machined at the desired spacing.

+ **2** HARDENED **PINS** . . . used to select locations according to the desired pattern of holes.

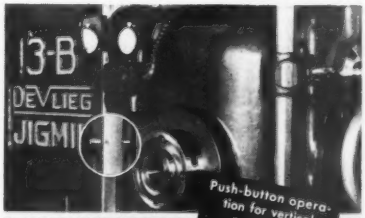
+ *Automatic* **POSITIONING** . . . accurately and dependably provides foolproof spacing for machining repetitive parts *without jigs.*

= DUPLITROL by DeVLIEG

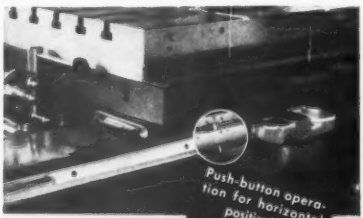
The finest known process for accurately spacing and machining holes.

THIS IS HOW IT WORKS . . .

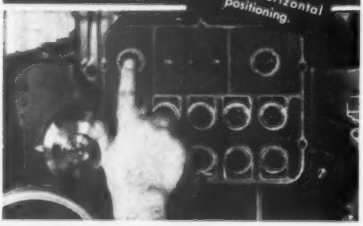
Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 3B DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.



Push-button operation for vertical positioning.



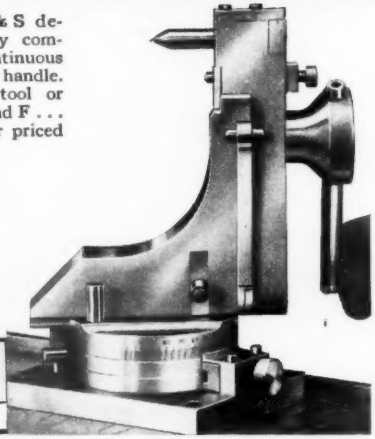
Push-button operation for horizontal positioning.



DeVLIEG MACHINE COMPANY — DEVLIEG JIGMIL — 450 FAIR AVE. FERNDALE 20, (Detroit) MICH.

*Fluidmotion** Radius and Angle Dressers save time in ACCURATE FORM DRESSING

"FLUIDMOTION", an exclusive J & S development, automatically blends any combination of angles and arcs in **one** continuous motion, with **one** setting, using **one** handle. Produces clean, precise form without tool or chatter marks. Available in models C, E and F . . . also the Form Master, an accurate lower priced dresser. Send for folder.



Fluidmotion FEATURES

- *automatic centering*
- *.0001" accuracy*
- *one setting per form*
- *14" wheel capacity*
- *large radius range*
- *dustproof*
- *chatterless*

*REG. U. S. PAT. OFF.

J&S TOOL CO.

481 Main Street, East Orange, N. J.

CRITERION *Boring Heads*

Original Accuracy *Maintained*

Noted for maintaining original accuracy over a longer period- Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

Write: Attention Dept. C

Lead Screw ground from solid AFTER hardening.

CRITERION MACHINE WORKS

BEVERLY HILLS, CALIFORNIA

Severance TUBING CUTTER GROUP - FOR FAST DEBURRING OF EVERY MACHINEABLE TYPE TUBE ...

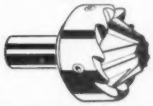
TUBE DEBURRING CUTTERS (Standard)

18 Standards in H.S.S. and Cemented Carbide

ADJUSTABLE TYPE

Adjustable from 1/2" - 2-1/2" O.D.—for short runs

TUBE CHAMFERING MILLS



23 sizes from 3/16" - 2-1/2" O.D. — Chatterless

SOLID TUBE DEBURRING CUTTERS

16 sizes from 1/4" - 1-5/8" O.D. — H.S.S. and Carbide

SPECIAL TUBING CUTTERS

From light hand-deburring up to close tolerance deburring, chamfering, flaring . . . For working non-ferrous metal, steel (including stainless) and plastic tubing . . . For combining reaming, sizing or flaring with end facing and deburring . . . Whatever the operation or material, Severance HSS and Cemented Carbide Tube Deburring Cutters are TOPS in performance — long life — economy.

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COMPLETE REGRINDING SERVICE BY NEW TOOL CRAFTSMEN SAVES YOU MONEY

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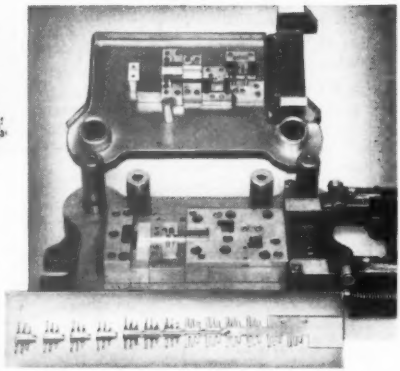
730 IOWA STREET
SAGINAW, • MICHIGAN

FEDERAL FACILITIES

Quality Tools such as this die, reduce production costs by combining many operations in a single tool.

Federal equipment, with latest modern techniques and skilled personnel are available for building all types of Dies, Jigs, Fixtures, Molds and Special Tools.

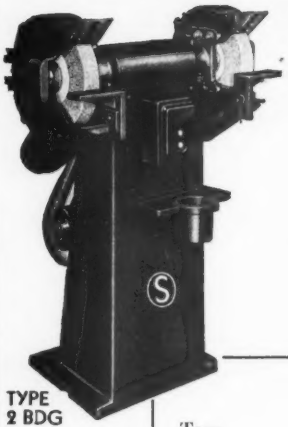
Let us quote on your tooling requirements.



A Combination of Forming and Twisting Operations Not Usually Obtained in a Single Die. Entirely Automatic, Feeding at the Rate of 100 Pieces Per Minute.

FEDERAL TOOL CORPORATION
400 N. Leavitt St., Chicago 12, Ill.

BELTED MOTOR DRIVEN GRINDER



TYPE 2 BDG

Be sure to visit us at Booth No. 83 at the Industrial Finishing Exposition, June 23—27.

that gives you these extras:

LONGER WHEEL LIFE
LOWER WHEEL COSTS
HIGHER PRODUCTION

at no extra charge!

HERE ARE THE FACTS

(a 12" 2 H.P. grinder is used for comparison)

	DIRECT DRIVEN (Motor on Spindle)	BELTED DRIVE (Motor on Back)
Type		**2 BDG**
H.P.	2	2
Wheel Diameter	12"	12"
Spindle Speed R.P.M.	1750 (60 cycle)	**1950 (any cycle)**
Peripheral Speed S.F.P.M.	*5400	**†6200**
Motor Diameter	**11"	
Spindle Housing Diameter		††6"
Wheel Clearance (Overhang)	½"	**3"**

ASK FOR QUOTATION.

*A new wheel is almost worn out at 5400 S.F.P.M. (Recommended peripheral speed is 5000 to 6500 S.F.P.M.)

**Motor housing interferes with large work.

†Type BDG Belt Driven grinder reflects ideal peripheral speed on wheels.

††Type BDG spindle housing diameter permits handling large work with no interference of machine housing.

MULTIPLE SPEED GRINDERS mean multiple economy—maintain correct peripheral speed, increase production, obtain maximum usable life from grinding wheels. Sizes: 10" 3-speed 1 H.P. to 30" 4-speed 50 H.P.

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Builders of THE STANDARD Vertical Spindle Grinder, Tool Post, Internal Grinders, Disc Grinders, Wet and Carbide Tool Grinders, Buffing and Polishing Machines, Speed Lathes.

The STANDARD ELECTRICAL TOOL Co.
CINCINNATI • OHIO

MT. HOPE & SIXTH STS.

The GOOD NEWS

VOL. 1 NO. 1 MAY 1947

"IT'S A GOOD DAY"

...runs a popular song and it's great to have Good News when you need it.

As we see it, a salesman can't sell a new machine by telling his prospect there's a depression just around the corner somewhere. No indeed - rather he will roll out on to the stage a striking backdrop like Lincoln Electric's new plant to be built on a site of 50 acres as soon as contractors can figure it.

Or perhaps he'll ask Mr. Prospect: "Heard about G-E's latest? No!! Building one of the country's biggest plastics molding, fabricating and extruding plants right over here in Indiana. And that's when they already rate as the top volume plastics producers."

You need optimism and enthusiasm and faith to sell. And don't worry about selling Mr. Prospect that machine even if we do have a bit of a recession, because once he's got it, he'll sell its output and very likely it will help to reduce the cost of his product. In any event, it will be there when he needs it.

Advertising is like that too. Take the fellow who loves the spot light. He is seen in the right places, with the right people and he talks about the right things -- frequently himself. He's a judicious advertiser.

Because you and we have the same purpose in life, we believe that you and THE GOOD NEWS will be fast friends. Dispensing Good News should be a pleasant business and as we send it to you from time to time we hope that it always arrives when you need it to strengthen your optimism, regenerate your enthusiasm or renew your faith. Good News should help to sell your goods and services and we hope ours, too.

"Then it will be a Good Day."

THERE IS NO LIMIT ... AND THE FUTURE IS GOOD

The report of the Twentieth Century Fund to be made public in full on May 5th will restore our faith in Free Enterprise and our confidence in our Country.

Evans Clark, Executive Director of the Fund, says in his foreword: "Our incentive genius, our organizing ability and our skills have given us here in the United States the greatest productivity and the highest standard of living in the world, enjoyed by the largest proportion of the population -- in spite of our strikes, depressions, unemployment and economic wranglings. If we can prevent the universal devastation of atomic warfare, and if we can continue to spread the benefit of a constantly increasing productivity in the United States, we can go on to economic and cultural heights as far -- and farther -- above those of today as those of 1947 are beyond the imaginings of our great-grandfathers back in 1840."

This Survey of America's Needs and Resources will prove that the American economic system is a dynamic, growing thing. It holds possibilities for capital expenditures: for starting new businesses, for producing such capital goods as new factories, stores, schools, hospitals, highways, railroads, transportation systems, etc., etc., probably beyond our capacity, so that a vast area for still greater expansion lies in the future.

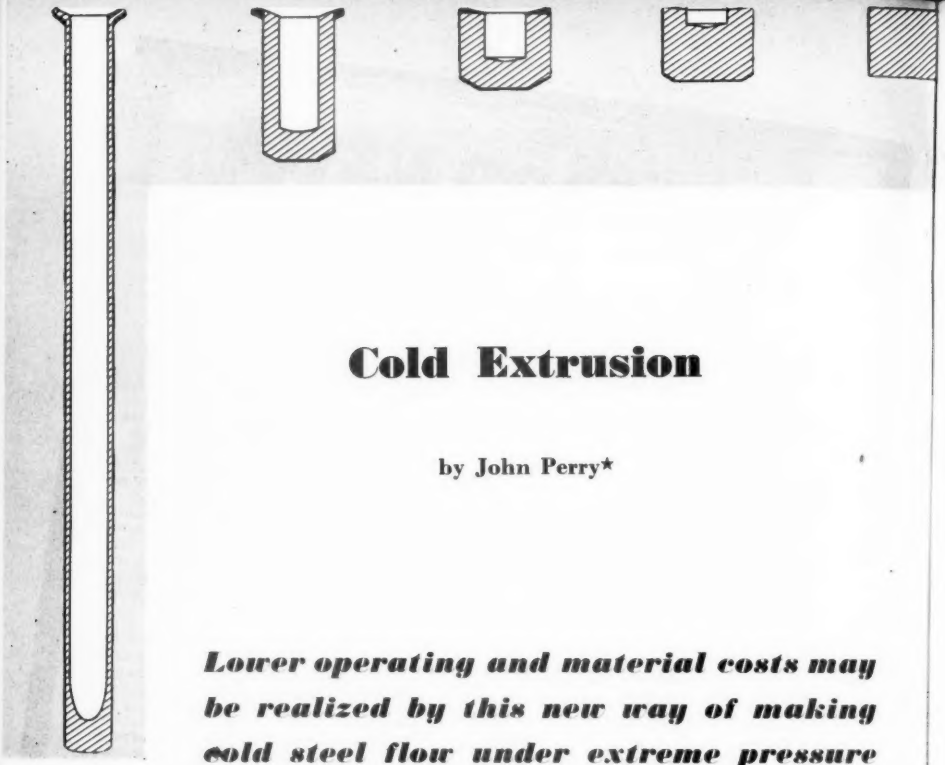
* * * * *

Such talk is powerful material for a bright look into the future. Old fashioned competition is on the way -- America wants just that and needs it. Redesigning and retooling will help to reduce the price, improve the appearance, and keep the wheels turning.

"The Bride Wore Coal, Air and Water . . . and Your 'Unseen Friend' was there." If you have seen the current advertisement of the International Nickel Co., Inc., you already know that the bride's gown was made of nylon tulle, a product transformed by the chemist from coal, air and water. The "Unseen Friend", of course, is nickel, so described because its corrosion-resistant characteristics insure the purity and cleanliness and freedom from contamination of the chemical compound.

Similarly, we believe that more constructive human action results from the mind which insulates itself against the corrosive influences which would have us believe that just about everything is wrong with the world.

The Good News will be our contribution to more constructive thinking and although published primarily for our advertisers, we hope this reproduction will interest our readers.



Cold Extrusion

by John Perry*

Lower operating and material costs may be realized by this new way of making cold steel flow under extreme pressure

In 1935, at the Neumeyer plant in Nurnberg, Germany, a group of scientists succeeded in forcing cold steel through an open die to form cartridge cases. Hot steel had been extruded in this fashion, both in Germany and the United States, and cold extrusion of nonferrous metals was well known in both countries. But in cold extruding steel this German group had taken a long step forward.

At first only shell-casings were made by cold extrusion. By 1942 it had been applied to the manufacture of many metal parts previously made by cold drawing, forging or machining from bars. Later, fuse bases, cylinders for airplane landing gear and many other cup-shaped or cylindrical objects were made by cold extrusion. Even wider use of the method would have been made but for the difficulty of obtaining high-quality tool steel and skilled men.

The German War Board recognized the strategic importance of the Neumeyer method and suppressed all mention of it. Patents were granted secretly and remained unpublished until after Germany entered the war. No patent applications were filed in any country not actively allied with Germany.

Soon after VE-day, W. W. Galbreath, a member of the technical staff of the Heintz Manufacturing Co., serving as an investigator for the Technical Industrial Intelligence Division, learned of the process. Going into Germany, he succeeded in finding the men who had developed it and the plants where it had been used. He reported from Frankfurt, in October 1945:

"Cold extrusion of steel opens up an

*Editor, *Federal Science Progress.*

PUNCHING INTO CLOSED DIE

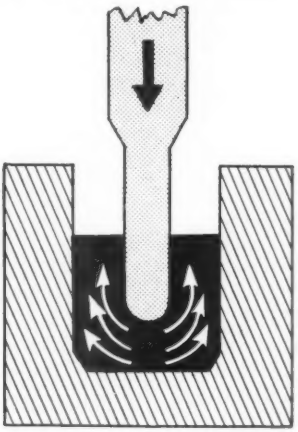


Fig. 1. In the first operation, the blank, after bonderizing, is placed in a closed die. The descending punch displaces and forces the steel upward, the diameter of the workpiece conforming to the ID of the die and the length or vertical dimension increasing.

entirely new field. The fact that the Germans were able to make cold steel flow by means of pressure exerted in the same manner that we have extruded tin, lead, copper, brass, aluminum, etc., opens up vast possibilities for making many different end products at greatly reduced cost. The dimensions of the cold extruded parts are so accurate that in many cases they will replace parts now made of malleable iron, grey iron, drop forgings, or parts completely machined from bar stock, without any machining at all. This in itself will make great savings in the cost of production of the finished part."

Since Mr. Galbreath's report appeared, experimental work with cold extrusion has been undertaken in the United States. By January 1947, successful cold extrusions of American steels had been made. There were still questions to be answered; and the extent to which American plants can use the process profitably is undetermined. But there is evidence to support investigator Galbreath's optimistic forecast.

The Extrusion Process

As practiced by the Germans, the steel used in cold extrusion was a low carbon, low silicon, deep-drawing steel of good homogeneous quality. The material was formed by the pressure of a punch in an open die, an annular shoulder on the punch forcing the steel through the die at a pressure of 170,000 to 230,000 pounds per square inch.

The secret of cold extrusion is "bonderizing", the phosphate coating of the steel after it has been annealed and pickled between operations. Bonderizing permits the lubrication of the steel, so that it will flow in the die under pressure. Force alone will not do the job.

EXTRUDING THROUGH OPEN DIE

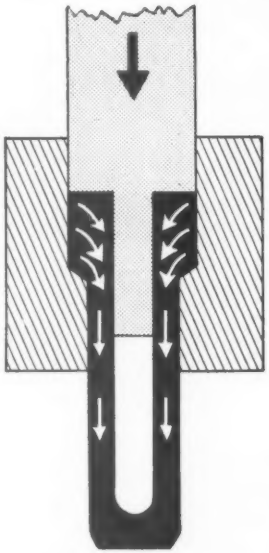


Fig. 2. In the final operation, the work is placed in an open die. Here the force is applied to the workpiece by the shoulder of the punch. The steel is forced downward and through the sizing ring of the die, resulting in a still longer and narrower cylinder. The forward part, or "pilot," of the punch shapes the inner cylinder wall.

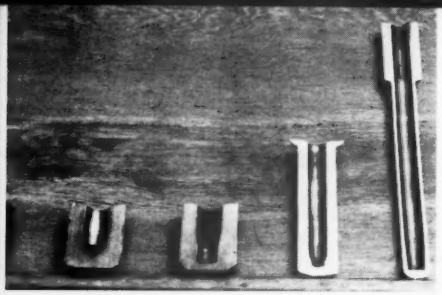


Fig. 3. A display of four stages of cold extrusion from initial slug, through the closed die operations and the final open die passes. To withstand the tremendous pressures built up, the dies are reinforced by shrinkage rings. The locked-up compression forces of the shrunk-on rings help offset the expansion forces of the cold flowing steel.

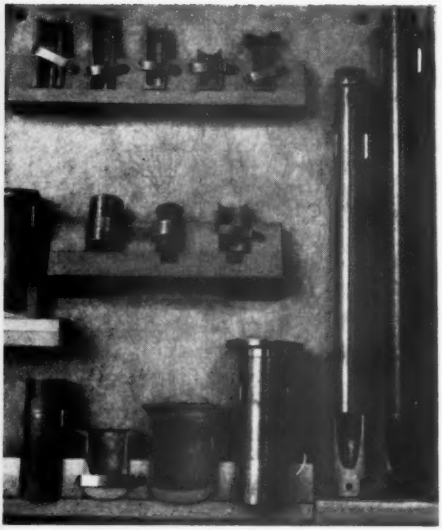


Fig. 4. Samples of work produced by cold extrusion. Provision must be made to remove the work from the press quickly after each operation because of the heat generated. In extruding into a closed die, the bottom of the die can incorporate an opposing punch to serve as a knockout. In the final extruding operations through the open dies, a "throw out" is provided to knock out the workpiece.

A typical operation begins with a solid steel cylinder 2¾" long, cut from a 3½" diameter bar.

First, a small depression is forced in the end of the bar, 1½" in diameter and about ¾" deep. This centers the succeeding extrusion operations.

The next step is to force a punch into the started hole, to a depth of about 2". Another punching operation, using a longer tool, carries the hole to 5" in depth by virtue of the flow of the metal up and around the punch.

These three steps, employing closed dies, yield a thick-walled hollow cylinder, slightly over 6" long and 2¾" in diameter, the center hole 1½" in diameter.

In the final step, a punch again descends into the hole. But this time the pressure is exerted by the shoulder of the punch. This pressure forces the metal through an open die less than 2" in diameter. The forward part of the punch now serves merely to shape the inner wall; as the pressure increases, the steel flows past the end of the punch. The final length of the cylinder is over 23".

When the German government was planning large-scale production of cartridge cases, the Neumeyer Co. proposed its method: the combination of drawing and cold extrusion instead of the conventional drawing practice. The conventional method required six drawing operations and three annealing operations. The Neumeyer method saved one draw and one anneal. The German government recommended that the method be adopted for all manufacturing of steel cartridge cases.

Cold extrusion was an outgrowth of Dr. Fritz Singer's work in hot extrusion. During the early 1920's, Dr. Singer, then director of Neumeyer, developed processes for hot-extruding both ferrous and non-ferrous metals. Later he developed a process for "stretching" tubing, a process which approximated cold drawing. At first he could draw only non-ferrous metals, not steel. Then he discovered that if he copperplated the steel, it could be drawn as well as other metals.

Copperplating was too expensive to be practical. Singer subsequently found that a phosphate coating worked equally well.

Bonderizing

Bonderizing is much the same as the bonderizing process used in the United

States to prevent corrosion. It is a chemical treatment which turns the surface of the steel into a phosphate, with a velvet-like finish. German data indicate that bonderizing performs two functions: it is a lubricant in itself and it prepares the surface of the steel so that it carries a lubricant better. In cold extrusion the Germans generally used a vegetable oil lubricant, such as rapeseed oil or palm oil.

Galbreath reported that the great majority of firms in Germany who were cold reducing steel in any way had adopted bonderizing. Dr. Singer's patents had over 300 sublicenses and more than 600 firms were using the method. It was used successfully in drawing wire, threading screws, cold drawing pipe, deep drawing any steel article which required great reduction and in extrusion. German production men said that bonderizing almost always reduced the necessary number of draws and anneals.

Bonderizing was done in Germany much as it is in the United States, but rinsing and drying do not require the same degree of care. In preparing for bonderizing, the surface is degreased and surface scale removed by pickling or sand blasting. After degreasing, the metal is rinsed first in cold, then in hot water.

The metal is submerged in the bonderizing bath for a few seconds to several minutes, while the bath is held at 90° to 98° C. Time and temperature are variable, as the desirable thickness of the phosphate coating depends on the drawing or extruding operation and can be established only by tests. After the bath, the metal is rinsed briefly and is then ready for application of the lubricant.

According to Mr. Galbreath's report, if American manufacturers are able to use the bonderizing process to the same extent that it is being used by the Germans, they may realize substantial economies by reducing the number of drawing and annealing and pickling operations.

Presses

Cold extrusion is possible on any press which gives the necessary pressure, stroke speed and precision of control. In Germany, various types of gear-driven mechanical presses were used: crank presses and toggle presses, both single and double acting, and eccentric presses, as well as vertical and horizontal frame hydraulic presses. Pressures up to 230,000 pounds per square inch were used. The highest speed was 12 inches per second; the travel was usually between 4 and 8 inches.

In developing a process for making a fuse base, one German firm designed a special triple-action knuckle-joint press with two downward slides and one upward action, the pressure on each of the three rams being 600 tons. The press was built on order of the German government, but machine work and assembly had not been completed by VE-day. The press has been taken over by the United States Army and presumably will be brought to the United States for testing and experimentation.

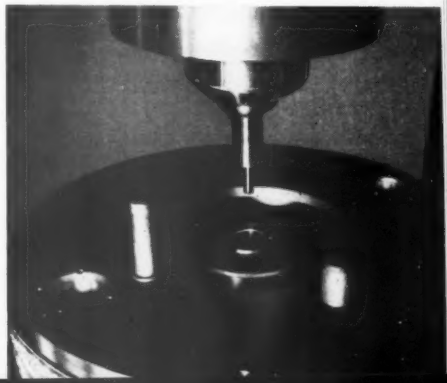
American Use

Few, if any, German processes could be carried over intact into American production. The economics of German industry are quite different and were even more so in wartime.

If a given part can be cold extruded, instead of machined from bar stock, there may be in some instances a saving of material greater than 80 percent. This may appeal to American firms because of its economy; to wartime Ger-

(CONTINUED ON PAGE 138)

Fig. 5. Showing an extruding punch about to descend into an open extrusion die. The two workpieces represent (right) before extrusion through the open die and (left) after completion of the extruding operation.



Shop Talk On Quality Control

Part II

Referring back to Figure 2, the reader is now partially familiar with the upper portion of the control chart. However, on an actual chart as used in the shop another or lower portion is added to the chart, as shown in Figure 5. This lower portion of the shop control chart shows a new area under the title: RANGES. Range is another term to be remembered along with the term 3-Sigma. RANGE simply means the spread of any given amount of sampled work. For instance, if an inspector picks out five samples *at random* from a tote pan of parts being ground on a Blanchard grinder for length, he may find, after measuring the parts under an amplifier, the following:

Part #1	2.1634″
Part #2	2.1637″
Part #3	2.1633″
Part #4	2.1630″
Part #5	2.1634″

by A. W. Ehlers

Contributing Editor

The spread in length is from 2.1630″ to 2.1637″ or from 0 to 7 "tenths". The RANGE is, therefore, .0007″.

From this RANGE (or spread) the Quality Control inspector mathematically computes the width of the 3-Sigma previously mentioned. This establishes the upper and lower control limits. It defines the width of the pavement or "green" zone where safe operation can be assured.

Enough of this for awhile. The reader is now familiar with the terms SIGMA, 3-SIGMA and RANGE. He also is familiar with frequency distribution curves and control charts, but he is no doubt wondering how all this will assist the operator or the inspector in preventing scrap at the machine.

The time has come for the writer to dispel one idea that is prevalent in the shop when Quality Control is first introduced.

The establishment of the upper and lower control limits, etc., are not set by theory alone in the quiet regions of the front office by the boys with the trick slide-rules. They are set by actual machine performance data recorded at the machine and are for that particular machine and the part being run only. Also, the science of Quality Control recognizes that all machine tools of the same type, design or vintage are not the same when it comes to producing work to close tolerance. Practical operators know that their 1932 "Betsy" is a cranky critter (there's one in every shop) and that the repair gang did a lousy job on the spindle bearings. Accordingly, a quality control chart is set up for "Betsy" alone, not for the entire line of machines on the operation in question. It may prove that "Betsy" can no longer be depended upon for close tolerance work.

To demonstrate the recording of data at the machine and for a particular di-

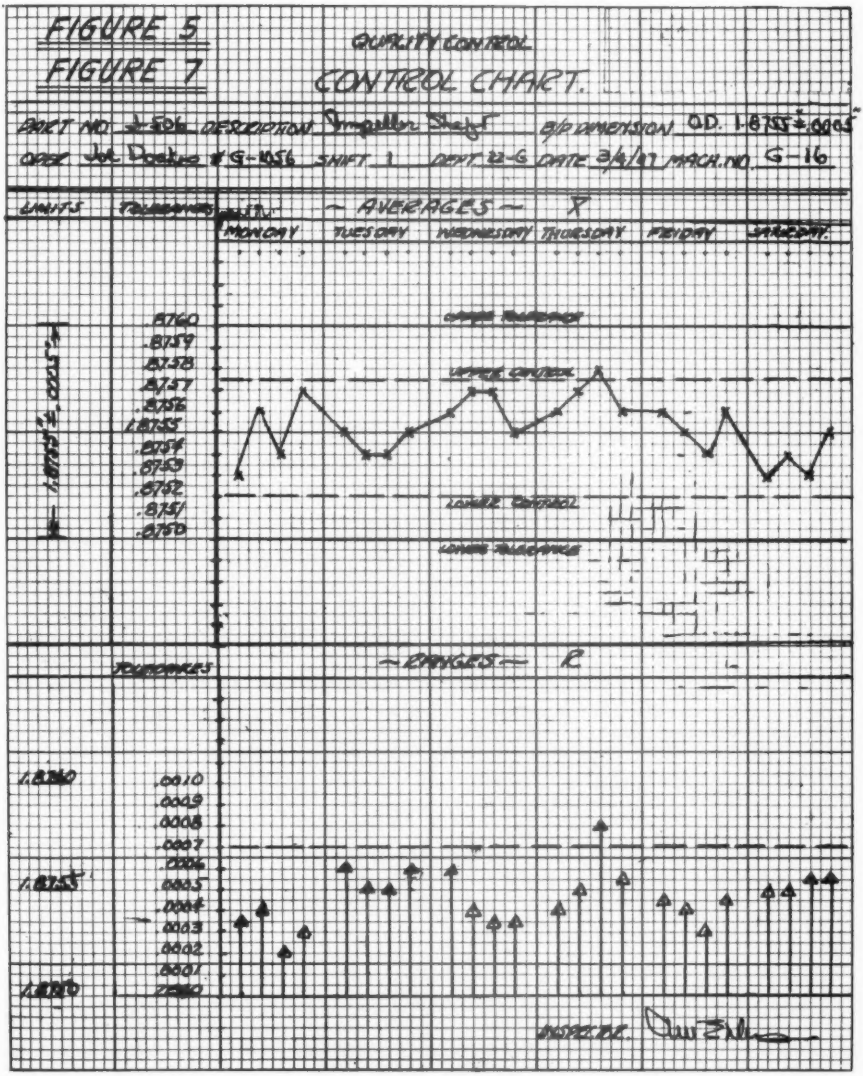


FIGURE 5
FIGURE 7
QUALITY CONTROL
CONTROL CHART.
PART NO. 450b DESCRIPTION Impeller Shaft O/D DIMENSION O.D. 1.8755±.0005"
ORDER Jos. Dooley & S-1056 SHIFT 1 DEPT. 22-G DATE 3/6/47 MACH. NO. G-16
UNITS
TOLERANCES
DATE
~ AVERAGES ~ X
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
UPPER TOLERANCE
UPPER CONTROL
LOWER CONTROL
LOWER TOLERANCE
1.8760
.8759
.8758
.8757
.8756
1.8755
.8754
.8753
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~ RANGES ~ R
TOLERANCES
1.8760
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.0010
.0009
.0008
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.0006
.0005
.0004
.0003
.0002
.0001
.0000
INSPECTOR

mension on a particular part let's introduce the WORK SHEET, Figure 6. The work sheet is placed at a 10" x 36" cylindrical grinder turning out the OD of an impeller shaft to 1.8755" plus or minus .0005".

First, we fill in the necessary data such as machine number, operator's name and clock number, part number, dimension to be checked, etc. We then select five pieces *at random* from the tote pan containing pieces the operator has just finished. A check under an amplifier gage shows 1.8756" for the first piece, 1.8751" for the second and 1.8755", 1.8758", 1.8754" for the balance. We call this sample No. 1 (Figure 6).

Fifteen minutes later or a half hour later (select some predetermined time dependent upon the production time cycle for the part; enough time for the operator to produce a fair quantity of work) we select *at random* five more pieces and go through the same measuring procedure and record the results on the work sheet. We call this sample No. 2. We continue in this manner until we have recorded fifteen samples. From ten to twenty-five samples are usually taken, dependent upon the critical dimension to be checked.

The WORK SHEET is then taken back to the office or shop desk and the five recordings of the first sample are totalled and the sum is found to be 4.3774, Figure 6, Sample No. 1. The 1.0000" of the original dimension is dropped because it appears throughout as a constant. Dividing this sum by five gives an average of .8754". The smallest dimension found in the first sampling of five pieces is .8751". The largest dimension found in the first sampling is .8758". The difference (Range or spread) is .0007". We record this and then take the next sample (No. 2) and go through the same procedure, Figure 6, Sample No. 2.

After all samples are tabulated, the fifteen averages are listed under "Sum of Averages" and added. The total is 13.1305". Divide this by fifteen and we have, as shown, a grand average of .8753". We call this $\overline{\overline{X}}$ (X-DOUBLE BAR), another arbitrary symbol used in Quality Control work. The fifteen ranges are added up and their total is .0087". Divide this by fifteen and we have the grand average of .0005". We call this $\overline{R}$ (R-BAR), also a symbol used in Quality Control work.

The inspector, or Quality Control observer, now has all the necessary data to establish the upper and lower controls to be used on the Control Chart. Simple statistical control equations are now employed, using the data from the work sheet and using constants taken from a simple table which will be shown in a later paragraph.

The equations, for both the upper and lower Ranges, or "R", are as follows:

$D_4\overline{R}$ or D_4 multiplied by $\overline{R}$, and
$D_3\overline{R}$ or D_3 multiplied by $\overline{R}$

For this particular operation on the 10" x 36" cylindrical grinder, G-16, and for Part No. J-506, Figure 6, we have found the value of $\overline{R}$ to be .0005". Next, what values are to be used for D_4 and D_3?

Here we have to look to a table of established values; values established by statistical mathematics. The acceptance of these values should be taken in the same manner as the reader would accept the values shown in a logarithm table or given for the gear combinations required to cut a certain thread on a tool room lathe. They are all correctly arrived at and produce exact results if properly used. The values for D_4 and D_3 vary according to the size of the lots sampled or inspected. From the tables we find:

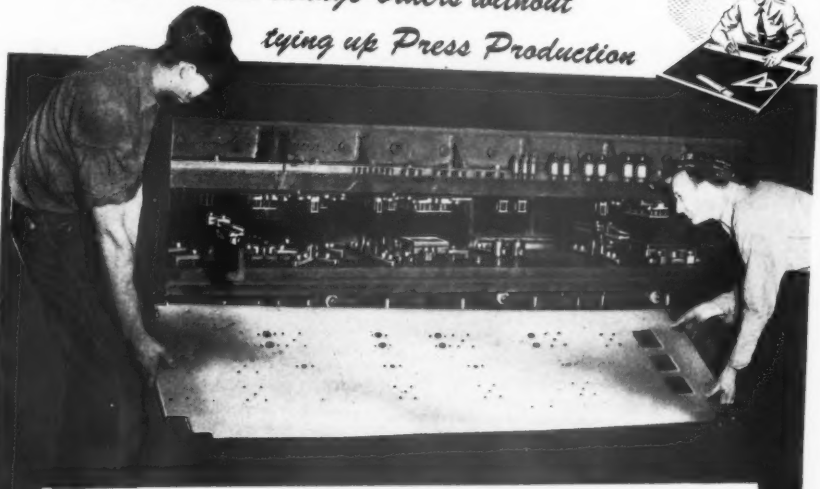
Sample Size	D_4	D_3
5	2.114	0.000
8	1.864	0.136
10	1.777	0.223
12	1.717	0.284
15	1.652	0.348

As we have used five observations per sample on our work sheet, Figure 6, the values for D_4 and D_3 are 2.114 and 0.000 respectively, and therefore:

$D_4 \times R = 2.114 \times .0005 = .001057$
$D_3 \times R = 0.000 \times .0005 = .000000$

(CONTINUED ON PAGE 140)

Meet sudden change-orders without tying up Press Production



WHISTLER

ADJUSTABLE PERFORATING DIES

quickly and easily rearranged

Change-orders from the engineering department usually cause plenty of headaches in production... particularly where die piercing operations are involved.

But... if you're using Whistler Adjustable Dies, there is no lost time—no waiting—no extra die expense. The same dies are easy to rearrange to the new design. Add units from stock, or delete sizes and shapes no longer required. Arrange the new set-up right on the press.

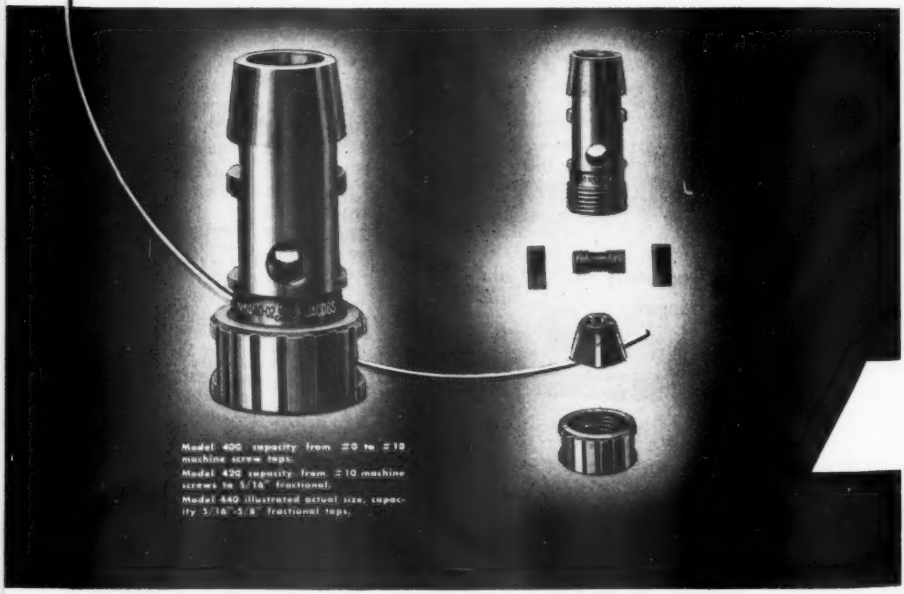
Consider the savings in production time alone. Then think how continued re-use of the same dies in subsequent jobs writes off first cost.

Whistler Dies can be used in practically any press. All parts are interchangeable. Precision is assured on long or short runs. Closer centers permit fewer press operations.

Deliveries are quick... little or no waiting. Standard round punches and dies up to 3" are available from stock. Ovals, squares, rectangles and special shapes can be made up in a few days. Write for the Whistler Catalogs today and get all the facts.

Here it is..

RUGGED, light and compact—featuring positive drive and accuracy—this new type Tap Chuck is ideal for use on all types of tapping heads and tapping machines. Lightness and compactness mean less torsional inertia on the spindle which contributes greatly towards reducing tap breakage—particularly in bottom tapping—and allows for quicker stopping and reversing of the tapping spindle. The heart of this chuck is the Jacobs Rubber-Flex Collet. Made as a single unit, the Rubber-Flex Collet is comprised of several hardened steel jaws permanently bonded into a synthetic rubber body. All working surfaces of this collet are precision ground after moulding and the collet is centralized by a ground conical bore in the chuck body, assuring extreme concentricity. Because the jaws of the Rubber-Flex Collet are rigid steel pieces ground to a fixed shape and all flexing is assumed by the resilient synthetic rubber web separating the jaws, parallelism of the jaw bites is assured throughout the entire range of the collet so that the smallest tap is held as firmly and as accurately as the largest.



Model 400 capacity from #0 to #10 machine screw taps.
Model 420 capacity from #10 machine screws to 1/16" fractional.
Model 440 illustrated actual size, capacity 1/16"-5/8" fractional taps.

BRAND NEW!

A STRONG, LIGHTWEIGHT TAP CHUCK

MADE WITH THE JACOBS RUBBER-FLEX COLLET

CHECK THESE SPECIAL FEATURES!

SMALL DIAMETER
Combined with light weight keep to a minimum the torsional inertia a holder builds up on a tapping spindle.

POSITIVE DRIVE
Floating back jaws provide positive drive on all sizes of tap squares.

GREATER GRIPPING POWER
The parallel bite of the Rubber-Flex Collet prevents disengagement of the positive drive.

SIMPLIFIED TAP CHANGING
Quarter turn of cap and the jaw screw disengages tap from chuck. Large sight hole facilitates tap changing.

GREATER ACCURACY
Completely ground collet and chuck body give unusual control of run-out.

WIDE COLLET RANGE
One collet takes all taps in its range. No individual sleeves or changing required.

For prices and complete specifications of this new chuck ask your Industrial Supply Distributor for Jacobs catalogue 47-T.

Jacobs Chucks

THE JACOBS MANUFACTURING COMPANY
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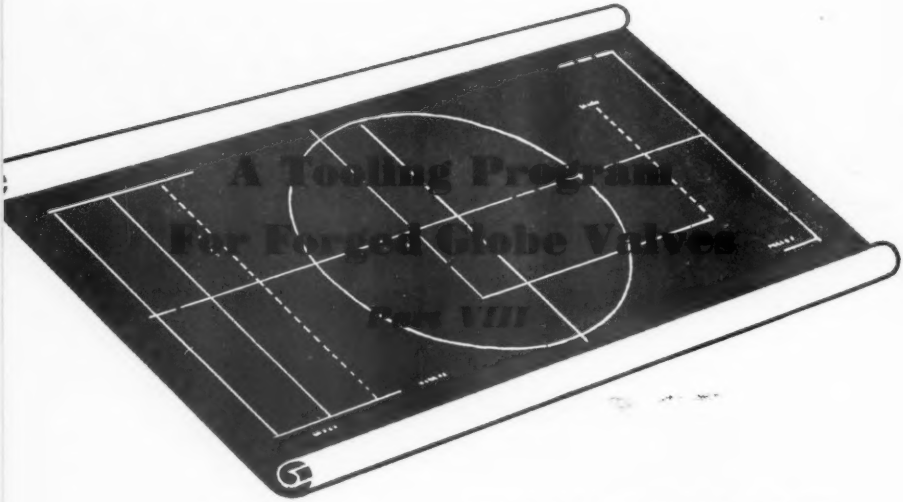


A Tooling Program For Forged Globe Valves

Part VIII

Valve Slide

The function of the valve slide component, F, Figure 24, of the Parker offset globe valve was described in Part VII, TOOL & DIE JOURNAL, May 1947. Producing the valve slide involves the use of three machines: A No. 2G Brown & Sharpe automatic screw machine; an "American" broaching machine; and a South Bend engine lathe. The tool operating mechanism of the No. 2G Brown & Sharpe was also described in Part VII.

First Operation: No. 2G Brown & Sharpe

The first set of machining operations performed on the valve slide is run on

by Carl F. Benner
Assistant Editor

the No. 2G Brown & Sharpe. The sequence of the tools used in the turret is indicated on the lead cam, Figure 48-A, which actuates and indexes the turret. The operations are rough turning, center drilling, drilling; recessing, Acme thread tapping, and countersinking. The forming, recessing and cutting off operations are performed by tools mounted on the cross-slides. The movements of the cross-slides are controlled by a separate cam, Figure 48-B.

At the start of the machining cycle, ¾" round bronze bar stock is automatically fed through the collet to the turret stock stop, A, Figure 49, set at the predetermined length of the workpiece. In making the setup for the stock stop on the Brown & Sharpe, two choices are available: either a turret stop or a "fly" stop. When there are six operations (full turret capacity) to be performed by end working tools mounted in the turret, then the fly stop is used. The fly stop is separate from the turret and operates in conjunction with the collet and feeding mechanism, and swings out of the path of the turret as soon as the stock feeds through and the collet closes. However, if there are only five operations performed by the end working tools, installed in the turret, then a stop is set up in the one available turret position. Thus the first position of the turret is the stop position as shown at A, Figure 49.

A roller box tool holder, set up with a turning tool-bit and a center drill, is mounted in the second position of the turret. As the turret, actuated by the

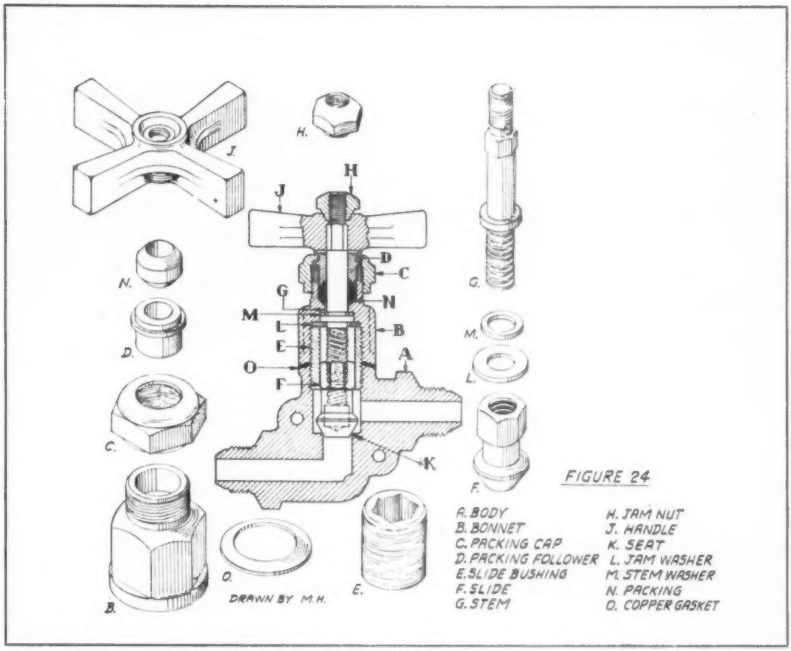


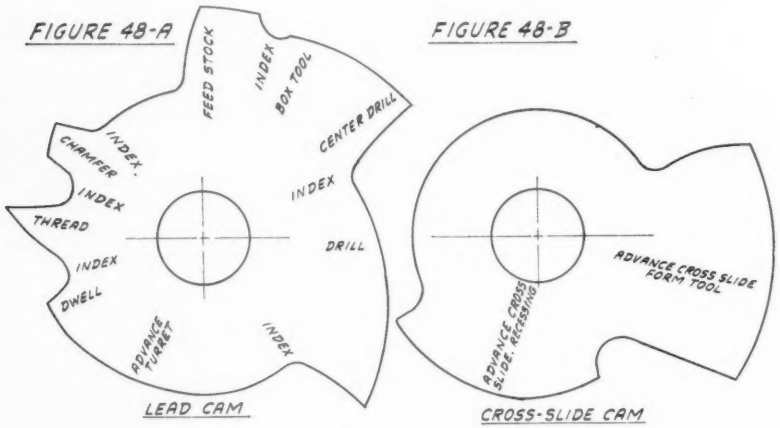
Fig. 24. Cross-sectional view of a Parker Brass Offset Globe Valve. Machined, working parts of the valve other than the forged body are shown and identified for the respective tooling operations.

lead cam, moves into the work a rough turning cut is made by the tool-bit, reducing the diameter to .627" and a centering hole is drilled by the center drill for the start of the next position drilling. The result of these two operations is shown at B, Figure 49. After the turret indexes, a circular form tool carried on the front cross-slide and a $\frac{13}{64}$" drill mounted in the third position of the turret move in to form turn the work profile and drill the $\frac{13}{64}$" diameter hole $1\frac{1}{16}$" deep as shown at C, Figure 49. To insure a free and easy operating valve, there can be no interference between the Acme threads on the end of the stem, G, Figure 24, and the wall of the hole below the thread in the valve slide. To avoid the possibility of such interference, the bottom of the $\frac{13}{64}$" diameter hole in the valve slide is increased to a $\frac{29}{64}$" diameter for a length of $\frac{1}{2}$" by internal recessing. Since a $\frac{3}{8}$"—12 external Acme thread is specified for the valve stem this will give the recessed hole a diameter $\frac{1}{64}$" greater than the diameter of the thread and which represents the clearance between these two parts.

To execute the recessing operation, a swing tool, A, Figure 50, is mounted in the turret. This pivoted swing tool is designed so that its recessing tool, B, Figure 50, can be swung a maximum of $\frac{1}{8}$" from center. The pivot mechanism is spring loaded so that the swinging arm will return to its normal center position at the completion of the recessing cut. The swing tool is fed by a guide, C, Figure 50, fastened to the side of the front cross-slide tool post, and which pushes against the swing tool as the cross-slide is moved toward the work

Fig. 48-A. Turret lead cam which governs the machining operations on the valve slide by the end working tools.

Fig. 48-B. The cross-slide is advanced by this cam for the forming and recessing operations.



by the cross-slide cam, Figure 48-B.

After the turret indexes from the third to the fourth position, the recessing swing tool assembly, just described, and which is mounted in the fourth position of the turret, moves into the work. The recessing tool enters the drilled hole in the workpiece and as it approaches the desired depth, the cross-slide moves in, and the guide, C, Figure 50, contacts the swinging arm, thereby feeding the cutting edge of the recessing tool into the inside wall of the drill hole to a depth of $\frac{3}{64}$". Thus the diameter of the bottom

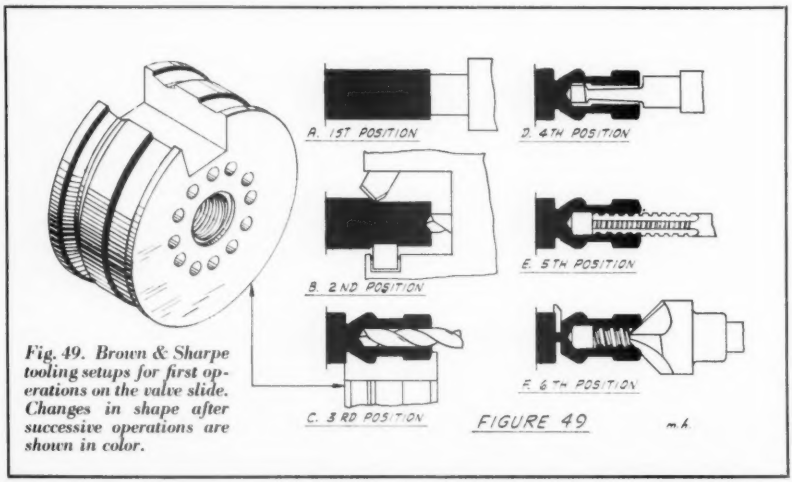


Fig. 49. Brown & Sharpe tooling setups for first operations on the valve slide. Changes in shape after successive operations are shown in color.

Fig. 50. The combination of tools utilized in the recessing operation is composed of: A, swing tool; B, recessing tool; and C, a guide which is bolted to the cross-slide tool post.

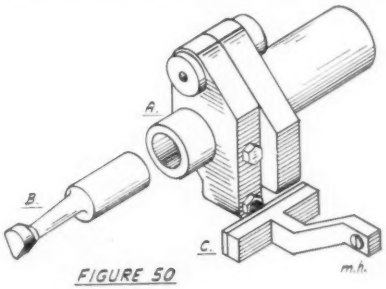


FIGURE 50

of the hole is increased by $\frac{3}{32}$". The recessed hole is shown completed at D, Figure 49.

As the turret indexes to the fifth position, a ⅜"—12 LH Acme tap mounted in the fifth position of the turret advances to cut a thread $\frac{13}{32}$" long in the workpiece as shown at E, Figure 49.

The last operation in the cycle is burring the threads cut in the fifth position and cutting off the workpiece. To remove these burrs a 90° countersink is set up in the sixth position of the turret and a cutoff tool is mounted on the rear cross-slide. After the turret indexes to the sixth position the turret advances the countersink to burr the threads to a 90° included angle on a $1\frac{3}{4}$" diameter. As the burring or countersinking is completed the rear cross-slide carrying a cutoff tool moves in to cut off the workpiece as shown at F, Figure 49.

Second Operation: Broaching Machine

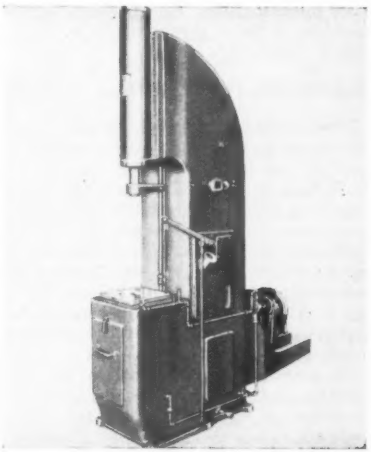
The upper part of the valve slide is broached to a hexagonal shape to conform to the inside hexagonal shape of the slide bushing, E, Figure 24. This operation is performed on an "American" hydraulic broaching machine, Figure 51, set up for straddle broaching. An indexing adapter, A, Figure 52, which has a ⅜"—12 LH Acme thread turned on one end, is used to hold the valve slide during the broaching operation. To position and index the hexagonal-shaped adapter during the straddle broaching operation, a supporting "V" block fixture of 120° included angle, B, Figure 52, is set up on the broaching machine table.

In performing the broaching operations on this part, the operator runs a valve slide on the threaded end of the adapter, sets the hexagonal adapter in the "V" block and starts the straddle broach downward. The shape of the workpiece after the first pass of the broach is shown at C, Figure 52. The operator turns the adapter through one-third revolution which positions it for the second pass of the broach, resulting in the shape shown at D, Figure 52. Another one-third revolution of the adapter positions the valve slide for the third pass. The shape of the valve slide after this final pass is shown at E, Figure 52.

Third Operation: Engine Lathe

The lower end of the valve slide is designed with two seats. One, turned to a 45° angle, fits into the seat of the slide bushing as described in Part VII, TOOL & DIE JOURNAL, May 1947, and the other, of 30°, serves as the flow shut-off when the valve is closed as shown at K, Figure 24. It is required that the

Fig. 51. An "American" hydraulic broaching machine is used for straddle broaching the valve slide hexagon.



surfaces of these seats be turned to a smoothness of 20 micro-inches. To obtain this smoothness, the finish turning is performed on a South Bend engine lathe, Figure 53-A, with a single point tool. A standard Hardinge $\frac{3}{16}$" hex collet, A, Figure 53, plus an inside, press fitted stop, B, Figure 53, is set up in the head stock to grip the valve slide by its hexagonal end for the finish turning.

All parts on one stock order are run through for the 45° seat turning, C, Figure 53; the setup is then broken down and a new one made to run the parts through for the 30° seat, D, Figure 53.

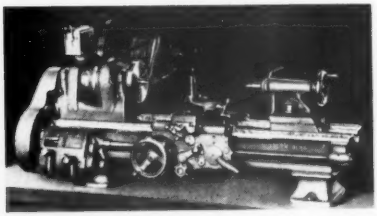


Fig. 53-A. A South Bend lathe is used for the operations shown in Figure 53.

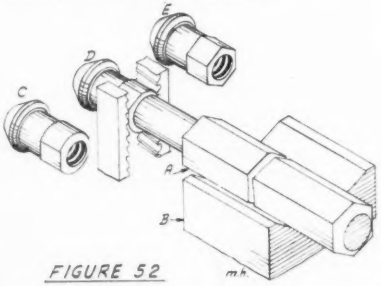
The function of the valve stem, G, Figure 24, of the Parker offset globe valve is that of actuating the valve slide, F, Figure 24, up and down to open or close the valve. Three machines are used in its manufacture: an automatic screw machine, a hand screw machine and a milling machine.

First Operation: No. 2G Brown & Sharpe

The first set of machining operations performed on the valve stem consists of turning $\frac{9}{16}$" (.5625") round bronze bar stock to a $\frac{5}{16}$" (.3125") diameter for a length of $\frac{31}{32}$" on the end of the workpiece; turning a .370" diameter for an additional $1\frac{13}{32}$" length of cut; form turning a retaining collar and making an undercut $\frac{1}{16}$" wide to .360" diameter; cutting a $\frac{5}{16}$"—24 thread on the end; chamfering thread; feeding out the piece to length and cutting off.

The operations performed by the end working tools installed in the turret of the Brown & Sharpe are indicated on the lead cam shown in Figure 54. The overall finished length of the valve stem is

Fig. 52. Showing the arrangement for indexing mandrel, A, in its supporting "V" block B, and the shapes imparted to the valve slide by the straddle broach after the first pass, C, second pass, D, and third pass, E.



$3\frac{5}{32}$", and its smallest diameter, .360", is at the undercut. It will be noted that there are two "feed stock" positions on this cam, at the beginning and end. If a sufficient length of stock was fed out at the start of the cycle to complete the workpiece, the danger of distortion due to bending of the stock while being machined might be encountered. To avoid this, only enough stock is fed out initially for those operations which are completed on the Brown & Sharpe machine, then at their completion the second "feed stock" function feeds the stock out for final cutting off to length.

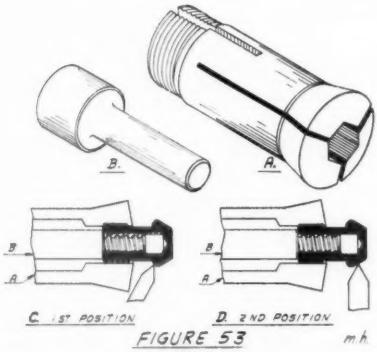


Fig. 53. Standard Hardinge collet A, and special, press-fitted stop B, as set up in South Bend lathe head stock to hold the valve slide while finish turning the 45° seat, C, and the 30° seat, D.

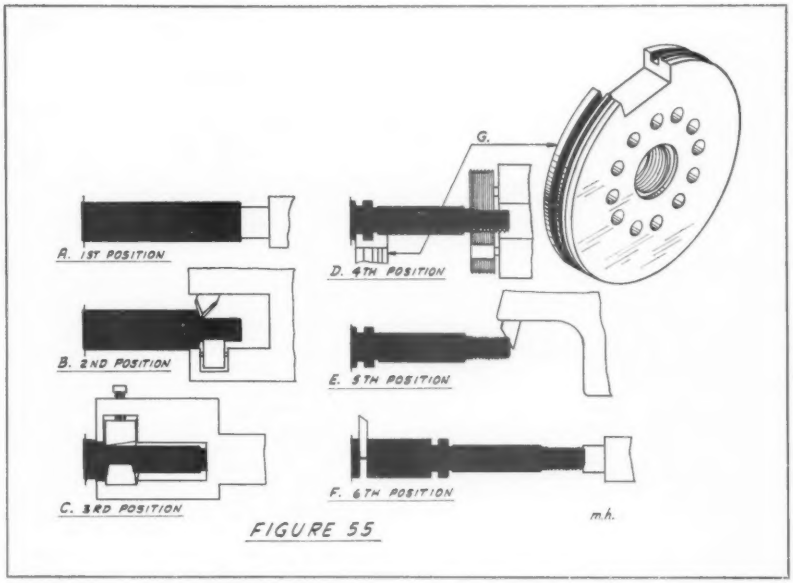


FIGURE 55

Fig. 55. Development of the valve stem by the first set of machining operations performed on the Brown & Sharpe. Colored portions represent the changes in shape of the workpiece from the feed out of the stock, A, to the cutoff at F.

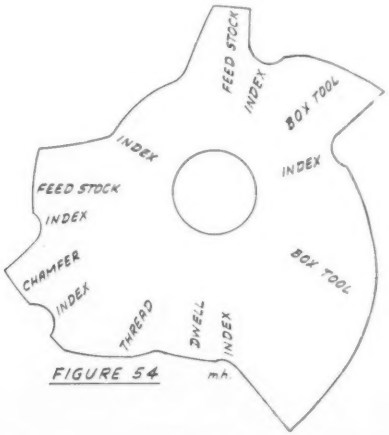


FIGURE 54

Fig. 54. Lead cam used to control the end working tools set up in the Brown & Sharpe turret for machining the valve stem.

Therefore the operation cycle is:

Feed out stock to first stop as set up in first turret position.

Stop set for the length of material required for the operations to be completed on the Brown & Sharpe machine as at A, Figure 55.

Turret indexes to second position.

A roller box tool holder, mounted in the second position of the turret, carrying a cutting tool, moves in to reduce the diameter of the bar to $\frac{5}{16}$" (.3125"), for a length of $\frac{31}{32}$", B, Figure 55, preparatory to a $\frac{5}{16}$"—24 threading operation. The shape of the turning tool and its position in the tool holder produces a 15° chamfer at the end of the cut. This chamfer will serve as the finished top surface of the hexagonal shoulder which will be milled on the stem in a subsequent operation.

Turret indexes to third position.

A turning tool set up in a box tool

(CONTINUED ON PAGE 148)

A Duplicator Must Duplicate

The precision machining of tools, molds or other workpieces, to be worthy of the term, must result in the faithful observance of the dimensional instructions, including tolerances, embodied in the designer's blueprint. This may be accomplished by either manual or mechanical control of the cutting tool or work.

When the control is effected manually, the success of the job depends on the intelligence and skill of the operator; intelligence in reading and interpreting the designer's blueprint and skill in manipulating the machine controls and in taking successive measurements of the metal removing progress, so that the work is finally brought to exact conformance with the blueprint instructions.

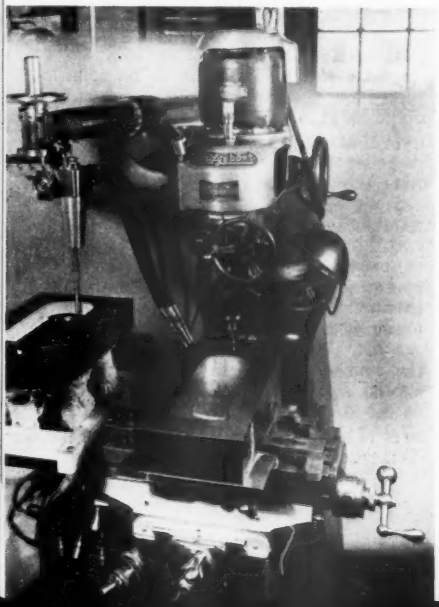
When the working control is by mechanical means, a master model or pattern is substituted for the blueprint and a sensitive, tracer-actuated feed control mechanism is substituted for the operator's manual skills.

Consequently, to the toolmaker the art and techniques of duplicating involve a mechanical means of precision machining the work so that it becomes an exact replica of a master model or pattern; and in precision toolmaking the exactness of the replica must be held to very close limits, in the order of one to three thousandths of an inch, depending on the nature of the job.

The extent to which exact duplication in tool making can be accomplished is well exemplified in the design and performance of the hydraulic duplicating attachments for machine tools as manufactured by the Turchan Follower Machine Company of Detroit. As applied to a vertical mill used for profiling a mold cavity, the problem resolves itself into two parts: (a) providing a smooth, uniform power feed for either the work or the cutting tool, and (b) a means for so sensitively controlling that feed by the profile of a master mold or pattern that the resulting accurate removal of metal leaves a surface that is a true duplicate of the master or original.

For the metal-removing feed, the Turchan equipment employs hydraulic power, which is ideal from the standpoint of a positive drive, free of lost motion and backlash, hence accurately responsive to

Fig. 1. The Turchan adjustable over-arm mount combined with the vertical screw plus the 90° compound carrying the tracer-valve body permit quick setups of master and work.



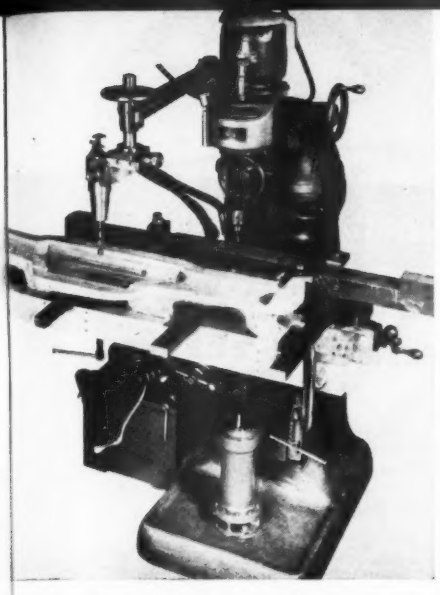


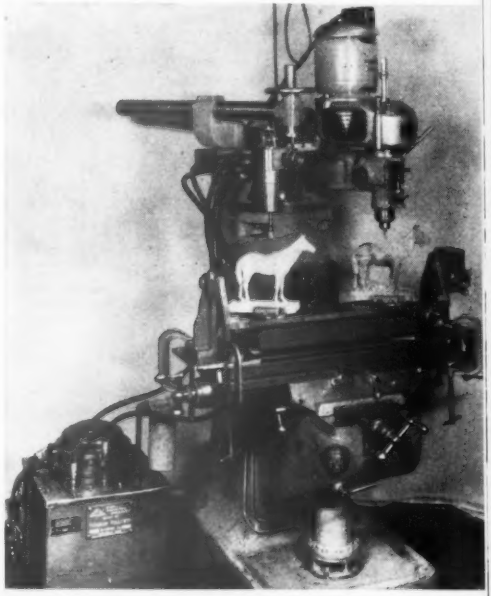
Fig. 2. In this Turchan-Bridgeport setup for milling a plastics instrument panel mold section, model and work are in fixed relationship on auxiliary base. Relocating auxiliary base along miller table permits doing work of greater magnitude than machine's feeds.

the control "dictated" by the variations in the profile being duplicated.

The combination of a tracer point or spindle and hydraulic two-way valve comprises the means for governing the hydraulic power feed; and it is the design, construction and performance of the tracer-actuated valve as a rugged but truly precision instrument that insures the extreme accuracy characteristic of the Turchan equipment. A hardened, ground and lapped piston and sleeve constitute the valve proper. The hydraulic circuit ports are machined into the piston and sleeve, hence their relationship never varies. The "porting" action of the valve within its sleeve is governed by the tracer point or spindle as it in turn traverses the profile of the master mold.

Figure 1 illustrates a Turchan-equipped Bridgeport turret-heat vertical mill. In this instance the work feed derives from the hydraulic powered knee of the machine. As the miller saddle, carrying the table and work, is fed in, the spring-loaded tracer "rides" the profile of the master mold. As the tracer

Fig. 3. Trunnion fixture for intricate job of duplicator profiling in one setup. Two handwheels provide fixture rotation about horizontal centerline and model and work rotation around respective vertical centerlines.



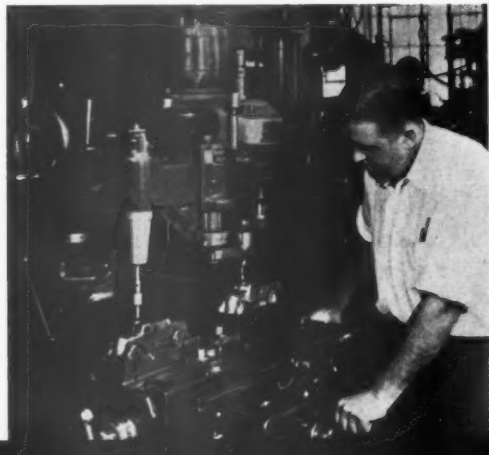


Fig. 4. This Turchan design provides hydraulic power feed to the Bridgeport spindle in precise conformance to the path of tracer over model surface.

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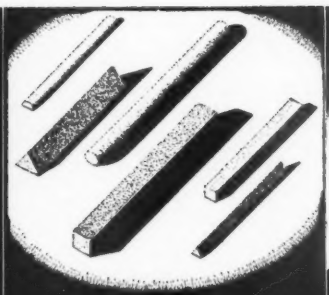

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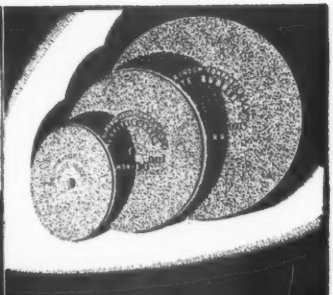

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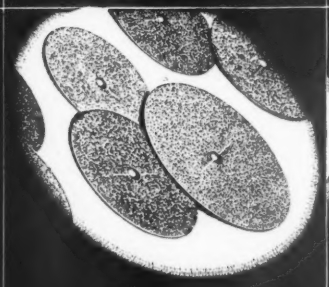

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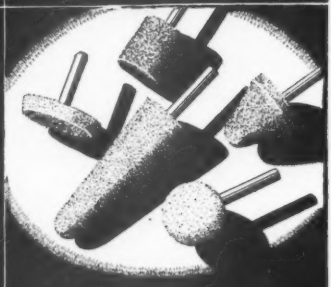

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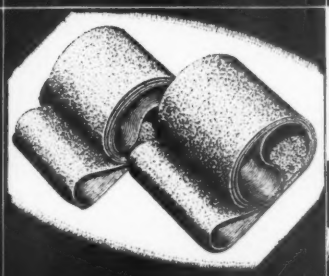

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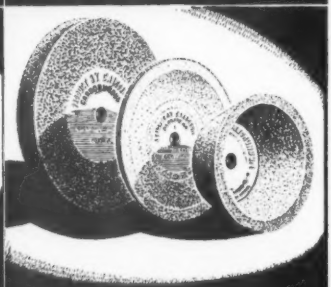

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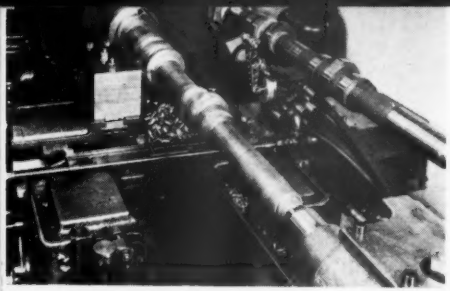


Fig. 5. A Turchan duplicator and lathe set up for machining cam lobes through the control exercised by the rotation of a master cam. The master and work are geared to rotate at the same speed.

by the over-arm which is extendable and can be swung horizontally. Final orientation of the spindle and cutter with the master and workpiece, respectively, is attained by the vertical screw and handwheel and the 90 micrometer cross-feeds that carry the tracer valve body. This means that the master model and the block of mold steel do not have to be painstakingly located or relocated in the same plane or indexed from a reference surface such as the edge of the table.

The flexibility and versatility of the Turchan hydraulic duplicating equipment is further illustrated by Figure 5 which shows a lathe setup for turning the lobes on a camshaft. An auxiliary, dual-drive unit or fixture is mounted at the lathe headstock spindle position.

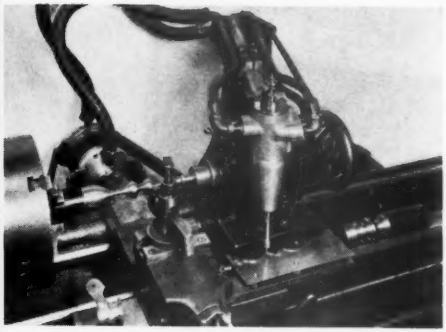
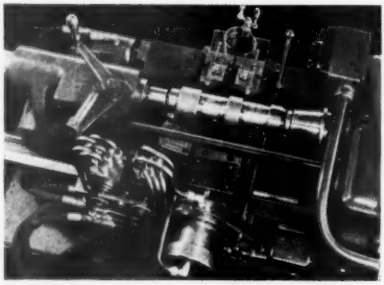


Fig. 6. Turning an intricate hour glass shape in conformity to the profile of a flat template. Because the template travels with the cutting tool past the stationary tracer spindle, the beginning, or right-hand start of the cut, is represented by the left end of the template.

spindle tends to descend into a cavity in the master, the miller knee and work are fed upwards to the cutter, and metal is removed from the mold in correspondence to the depression in the master. The instant that the tracer is deflected upward by a rise in the master profile, the work is fed down or away from the cutter, resulting in a rise (less metal removed) in the mold surface. When no vertical displacement of the tracer spindle takes place during the in-feed of the saddle (due to a level path on the master) there is no vertical movement of the work, hence a flat area is machined in exact conformance to the master.

A wide range of adjustment is provided for the tracer spindle and valve unit. It is positioned above the master

Fig. 7. Sizing bearing bushings by publicator mechanism control for both depth of cut for final OD and length of cut. The special arbor is quickly opened up for loading and unloading four bearing members in the two positions.



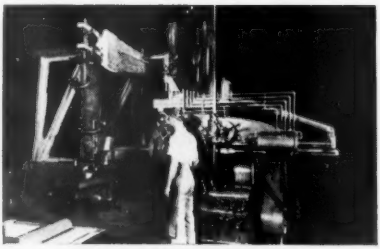


Fig. 8. A horizontal boring mill duplicator application to the machining of a mold section. The tracer spindle controls the in and out feed of the boring mill spindle.

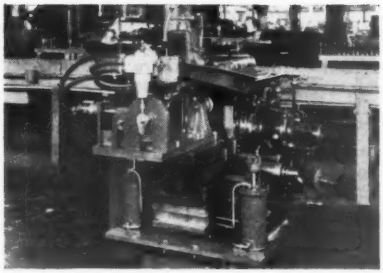


Fig. 9. A shaper set up for producing an irregular shape through tracer control form a master. The work feed is the rise and fall of the shaper table, powered by the two hydraulic cylinders.

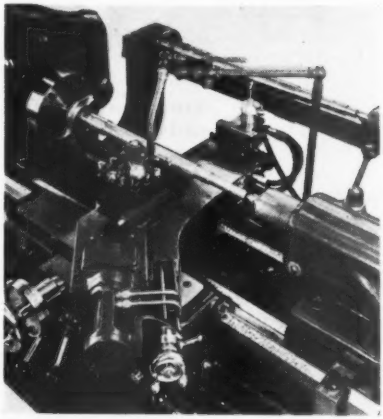
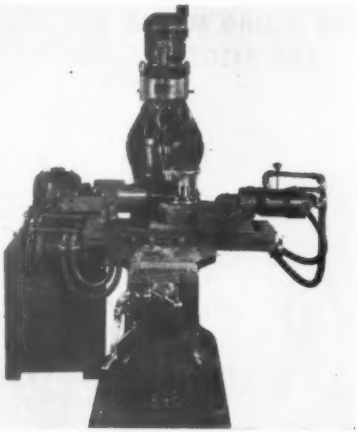


Fig. 10. A stepped shaft duplicating job with the master shaft mounted between centers supported from the rear of the lathe bed.

This serves to drive the master camshaft model and workpiece at the same speed. The duplicator valve unit is mounted on the rear of the lathe cross slide. A rocker arm is pivoted on the valve housing and actuates the tracer control spindle by the radial variations of the master cam or lobe. The side cutting tool, shown in the toolholder block, in feeding toward the headstock removes metal from the workpiece in conformity to the profile of the master cam.

An unusual duplicating-turning job executed with Turchan equipment is illustrated in Figure 6. This consists of turning an "hour-glass" shaped spindle to the profile of a flat master template. The tracer unit valve body and its mounting bracket are secured to the rear of the lathe bed, and are adjustable as to final, fixed position, in order that the tracer spindle and template may be correctly oriented with the cutting tool and workpiece. The flat master template is mounted on a supporting bar carried by the lathe cross slide. The hydraulic cylinder for controlling the cross feed is mounted at the rear of the lathe carriage. The varying cross feed is effected by linking the hydraulic piston to the cross slide. In turning this shape, as the cut proceeds from right to left, or as the cutting tool is carried by the regular, power longitudinal feed of the carriage from right to left, the stationary tracer spindle is "riding" the travelling template relatively from the left end to the right end of the template. In other words, the further the cut proceeds to the left, the closer the tracer spindle is working to the right-hand end of the template. As the tracer rides the varying edge of the

Fig. 11. Duplicator controlled profiling of an irregular shaped flange around a carburetor body. Rotating fixture incorporates master profile.



template, the hydraulic cylinder and piston varies the movement of the cross slide (in or out) so that the work is given the same profile as the template.

A highly specialized tooling job incorporating a duplicator control is shown in Figure 7. The production job is that of taking a final sizing cut on the OD of replaceable split-bushing bearings. Four half-bearings are loaded on the special work-holding arbor by releasing the tailstock spindle. This opens up the spaces between the work-retaining collars so that the beveled edges of the bearings can be gripped between them. The diameter of the work-retaining collars is sufficiently less than the finished OD of the bearing so that there is no danger of interference between the cutting tools and the collars. With four bearing halves loaded in the two positions on the arbor, the cross slide carrying the two turning tools feeds in to the proper depth. This depth is determined by the setting of the special micrometer stop shown to the left of the cross slide. Two Turchan control valve units are shown secured to the rear of the lathe bed at the left. They operate in tandem by the cross-head that spans them. The moment that the micrometer stop contacts the forward end of the cross-head,

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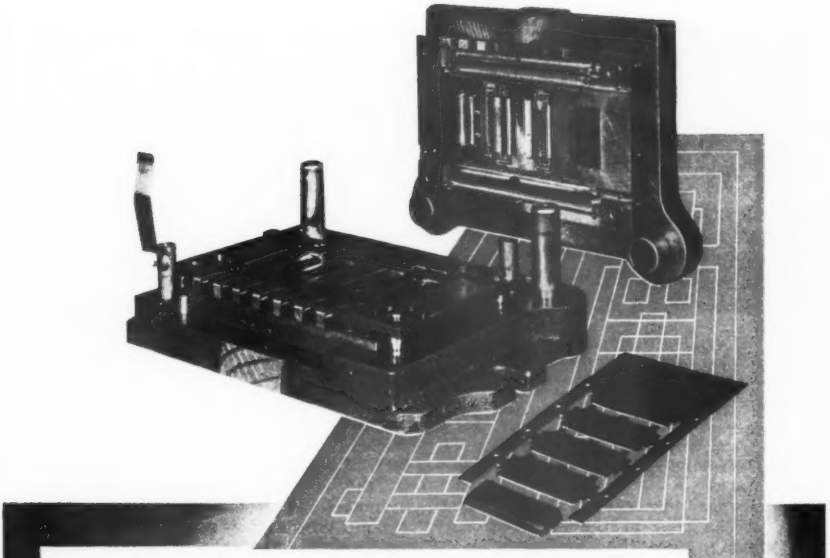
Dr. Gaillard plans lectures mornings and afternoons, followed by round table discussions.

For further information, write to Dr. Gaillard at 400 West 118 St., New York 27, N. Y.



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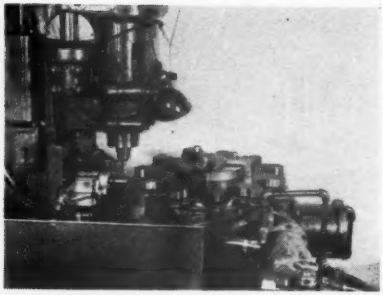

Fig. 12. Milling a sprocket shaped cam of intricate, close tolerance, profile. Master cams govern both table feed and work rotation.

the in-feed to depth ceases and the carriage traverse feed (for length of skim cut) starts.

One hydraulic cylinder and piston unit at the rear of the lathe carriage functions to feed the cross slide in to depth of cut; and another hydraulic unit secured to the front of the lathe bed is linked to the carriage to provide the longitudinal feed for length of cut. The Turchan valve unit mounted on the rear of the lathe bed at the right stops the carriage travel and starts the return of the cross slide to its outward limit. The auxiliary hand control extending alongside the cross slide effects the return of the carriage to its starting point for a new load and cycle.

The illustration, Figure 8, shows a universal, horizontal boring mill setup for machining a mold section in duplicate of a plaster master model. In this installation the Turchan tracer scans the master model by means of the table power cross feed. The table and angle plates carry both the workpiece and the model. The Turchan tracer valve controls the in and out feed of the boring mill spindle and cutter. The tracer valve body is shown mounted with a flexibility of adjustment that permits locating the end of tracer spindle in the same vertical plane as the end of the cutting tool.

That duplicating control mechanisms can be applied to shaping operations is shown by the setup in Figure 9. Between the centers of the special fixture on the shaper table a workpiece is mounted which is to be profiled to the shape of the master that is under the tracer spindle. The master is slowly rotated during the course of the cut by the gear train and worm drive from the hydraulic motor mounted outboard to the left. The tracer spindle, as it "rides" the rotating master, controls the up and down feed of the work in relation to the ram. This feed is powered by the two vertical hydraulic cylinders at the ends of the cross saddle.

Figure 6 illustrates a stepped shaft duplicating job. The master shaft or control pattern is mounted between the centers that are supported by brackets secured to the rear of the lathe bed. The Turchan tracer spindle and valve unit is positioned on the rear of the lathe cross slide. The cut is taken from right to left using the power longitudinal feed of the lathe carriage. The hydraulic cylinder and piston unit in the foreground effects the cross feed in accordance with the travel of the tracer spindle along the master stepped shaft.

Profiling the irregular shaped flange around a carburetor body with a setup on a Bridgeport turret mill is shown in Figure 11. The workpiece is slipped over the special fixture which is rotated by the fluid motor and gear train shown at the right. At the left is the hydraulic unit which powers the longitudinal table feed. Two governor valve units, actuated by the one tracer spindle, serve to control the work rotation and table feed so that the work is profiled as the tracer follows the rise and fall of the master profile pattern at the base of the fixture.

Figure 12 shows a job similar to that in Figure 11 except that two masters are used: one to govern the table feed, and the other to control the rate of work rotation. Because of the extreme irregularity of the shape being profiled, the amount of metal to be removed per degree of rotation varies so greatly that it is necessary to constantly vary the rotational speed or feed of the work in relation to the traverse feed of the miller table.

The two cams controlling the varying movements are under the workpiece at the fixture base. Their relative difference in profile is readily apparent.

Pressed Metal Institute Combats Black Market

Specific firm offers of over-priced "black market" steel sheets and strip aggregating more than a million tons and ranging in price up to $250 per ton have been reported to the Pressed Metal Institute by its members, according to Tom J. Smith, President of the Institute, speaking at a recent Cleveland District Meeting to more than 180 pressed metal manufacturers.

"The danger inherent in this situation can hardly be overestimated", declared Mr. Smith. "The Pressed Metal Institute will continue its determined campaigns, in cooperation with the Iron and Steel Institute and with government departments, for the return of foreign battlefield scrap and against (1) black market steel, (2) high prices for scrap, (3) withdrawal of hot rolled steel from sale, and (4) exchange of billets for scrap, despite the fact that certain steel producers have intimated to members of the Institute that they want these campaigns stopped.

"Since early February, when the Institute's campaign was initiated, scrap prices have fallen approximately ten dollars per ton and offerings of black market steel have been lessened to some extent," Mr. Smith pointed out. "Further, the Institute's activity to facilitate the return of foreign scrap has focussed widespread attention on the importance of this problem; Congress and the State Department are now cognizant of the situation and have indicated that corrective steps will be taken. Organized effort to get action on this front is now well under way.

"Every possible effort will be made by the Institute during the weeks ahead to assure a sufficient volume of both hot and cold rolled sheet and strip steel to meet the requirements of the pressed metal manufacturers," said Mr. Smith in conclusion. "Adequate supply of steel is the only factor in the outlook of the industry for 1947 which does not augur a year of the largest production of stampings in the industry's history."

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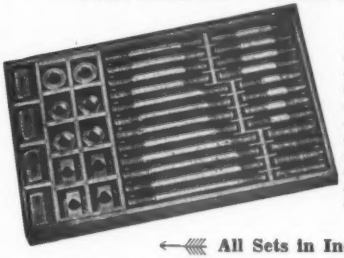

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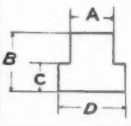

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DON G. GARDNER

News of the death, on May 15, 1947, of Don G. Gardner came as a profound shock to his countless friends in publishing and industry circles.

As head of Gardner Publications, Inc., of Cincinnati, he directed the publishing of the well-known "Modern Machine Shop" since 1928 when he conceived the idea of a magazine of digest-size, directed to the machine shop reader. Established later were "Products Finishing" and a Latin-American publication, "El Taller Mecanico Moderno and Oficina Mecania Moderna."

Contributing to his publishing successes was a seventeen-year background including western newspaper advertising space sales, western managership for the W. R. C. Smith Publishing Co. of Atlanta, and culminating in 1919 with his appointment as southwestern manager for "Iron Age." This latter post he occupied until the founding of his Cincinnati company.

In addition to his hobbies of hunting and fishing, Gardner was an energetic and enthusiastic worker in cultural, civic, business and patriotic affairs, belonging to many prominent local and national organizations in those fields.

In the untimely death of Don G. Gardner, at the age of only 58, contemporary industrial publishing has lost a friend and leader of long standing. E. W. P.

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This statement is taken from the foreword of "New Profits Through Sensible Depreciation," a very recent informative booklet published by Kearney & Trecker, discussing the factor of obsolescence in figuring depreciation of productive equipment—specifically machine tools.

By means of charts and tables, the fallacy of using the usual long term depreciation charge-off on machine tools, without consideration of obsolescence, is most vividly expressed.

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A method of determining the obsolescence factor is worked out and applied as a practical solution to this problem.

The story has two possible endings: one in which the policy of using long term depreciation is followed, and the other in which the method of short term depreciation and obsolescence is adopted.

A break-down of machines over ten years old by industry groups and statistics on the age of individual machine tools are presented in graph and table form.

Copies of this most informative booklet are available on request from Kearney & Trecker Corporation, Dept. 5-92, Milwaukee 4, Wis., or use INFORM-A-GRAM Key No. 592-Y.

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In addition to being of interest to machinery users, the book has an important application in the educational field, particularly for those companies conducting veterans' training and other apprentice schools of their own, colleges, universities and vocational schools. Copies of "LeBlond Dual Drive" may be obtained for $1.00 from the R. K. LeBlond Machine Tool Co., Att: Roger R. Ruzicka, Cincinnati 8, Ohio. Money to accompany order.

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Navy Develops Control Flux

Consistently strong silver brazes can be produced without detriment to the metal or danger to the brazing operator by using a control flux developed by the Navy Department's Bureau of Aeronautics shortly before the end of the war. Although much information had been published previously about properties desirable in silver brazing fluxes, little quantitative data on specific flux compositions and performance was available prior to the investigation.

Composed of 50 percent potassium tetraborate, 30 percent potassium acid fluoride, 15 percent potassium fluoborate, and 5 percent boric acid, the control flux was tested by torch brazing, using a commercial silver solder known to present a difficult fluxing problem and compared favorably with commercial compositions. It satisfies all requisites for a standard flux for silver brazing alloys flowing at temperatures up to 1,300 degrees Fahrenheit and, with some limitation in flux film persistence, up to 1,400 degrees Fahrenheit; and is considered adequate for the majority of commercial siver brazing alloys.

The composition, properties and experimental development of the flux are described in a report by Lt. A. E. Rising, Jr., USNR, covering a four month investigation at the Naval Air Material Center, Philadelphia, Pa. Included are a summary of some patents on siver brazing fluxes and a table of results obtained in tensile tests of joints made with both the control and commercial fluxes.

Orders for the report, "Control Flux Composition for Silver Brazing—Navy Specification 51F4" should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., accompanied by check or money order. (Photostat, $3; microfilm, $1.)

I S O Makes Progress

The International Organization for Standardization (ISO), set up provisionally at a meeting of 25 nations in London last October, has become the official body for international standardization work following ratification of its constitution and by-laws by the national standards bodies of 15 nations, Charles leMaistre, secretary in charge of the provisional office, notified the American Standards Association from London today.

Technical work of the international organization is going forward without delay although the shortage of office space in Geneva, Switzerland has delayed the opening of the headquarters. At present, a committee representing the United States, Great Britain, France, Belgium, Russia and Brazil, is surveying the field to secure a secretary general to take charge of the new permanent ISO office which is expected to be in operation by early autumn.

Unauthorized Solvent Use Often Unsafe

In most plants, regular solvent operations are kept safe through proper ventilating systems and other controls. However, even in "safe" plants, employees may take it upon themselves to employ solvents for improper purposes, thus opening the way for fire or illness.

Control of solvent distribution within the plant can help to prevent unauthor-

ized use of solvents. Such use, or rather misuse, of solvents is not only wasteful but it sometimes results in serious accidents which give rise to unwarranted fears of properly regulated solvent-using operations.

One fairly widespread example of unauthorized employment of solvents is their use for cleaning hands or clothing at the end of the work day. This very often causes drying, cracking and infection. Improper handling of solvents in this manner may also result in inhalation of unsafe quantities of solvent vapor and, in addition, may create a fire hazard.

In other cases, flammable solvents have been taken home to do dry cleaning. Fire safety procedures, which are taken for granted in the plant, are often ignored in the home with disastrous results.

Elimination of unauthorized solvent use is thus important to both management and employee, and should be a permanent part of the safety program . . . *Safety Research Institute.*

National Inventors Council

A transparent plastic substitute for window glass which will fold compactly and not become brittle, fuels, lubricants, and alloys which will satisfactorily retain their physical properties at temperatures to 65 degrees below zero Fahrenheit, methods for compacting soil to bear temporary heavy traffic loads, and twenty other technical problems are of immediate concern to the Army and Navy and await solution by America's inventors, according to the National Inventors Council.

The problems submitted to the council by the War and Navy Departments were described by NIC members at the Council's spring meeting held at the Department of Commerce. Dr. Fred Zeder, council member, and vice-chairman of the board of the Chrysler Corporation, presided at the meeting in the absence of Charles F. Kettering, council chairman.

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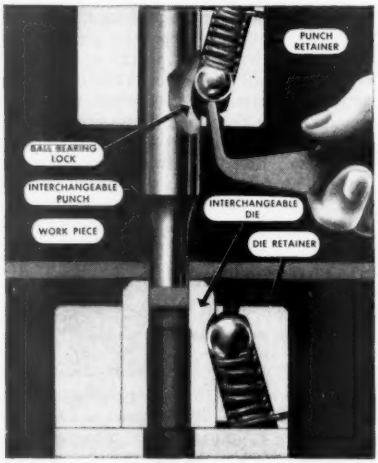

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tailed descriptions upon request to the National Inventors Council, Office of Technical Services, Department of Commerce, Washington 25, D. C.

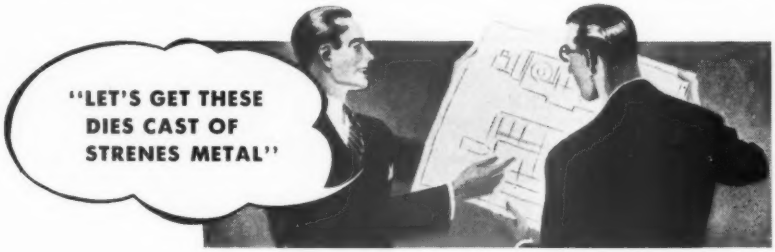
About 300,000 inventions and ideas of possible military merit have been reviewed by the National Inventors Council since its establishment for this purpose in 1940. Of the total received about 12,000 have been forwarded to the armed forces for further consideration and possible development in cooperation with the inventor.

Ceramics And Metal Soldering Report

A simple, efficient process for soldering ceramics and metals together was developed in Germany during the war, according to a report prepared by Eugene D. Reed for the Vacuum Tube Development Group of Columbia University's Division of War Research. Used in the manufacture of electronic decimeter tubes for continuous wave oscillators, radar transmitters and high frequency and superheterodyne receiver amplifiers, this soldering process made it possible to construct vacuum-tight tubes of ceramic and metal materials.

According to the Berlin engineers, this construction (1) simplified the assembly of multi-element electrodes and grids; (2) facilitated the compact and precise location of axial-symmetrical elements; (3) permitted mass production with the use of unskilled help; and (4) expedited the formation of high vacuums.

Also contained in the report are complete details on the mechanical construction and electrical characteristics of all the metal-ceramic triode and magnetron tubes which the Germans manufactured. Address orders for "German Metal-Ceramic Technique and Metal-Ceramic Decimeter Tube Series" to Office of Technical Service, Dept. of Commerce, Washington 25, D. C., accompanied by check payable to the Treasurer of the United States (photostat, $2; microfilm, $1).



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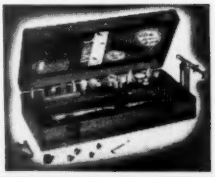
Speed with power with precision—that's the new PRECISE 40. Surpasses our own PRECISE 35 which outworked every tool in the field. In strong, light plastic case, PRECISE 40 weighs only 40 oz.—packs a record 1/5 H.P. New type quill mounts precision collet chuck or grinding wheel arbors of various sizes; push-button spindle lock for quick tool change. 90% greater cooling; four oversize ball bearings. Quickly lubricated by pressure gun through ball-valve inlets. Tool mounts in vise, lathe, stand, or milling machine or can be used with PRECISE accessories for special applications. Guaranteed shockproof without ground wire.



SEND FOR IT

PRECISE PRODUCTS CO.
1341 CLARK ST., RACINE, WIS.

PRECISE 40

DRILL JIG BUSHINGS

Accurate

Interchangeable

Concentric

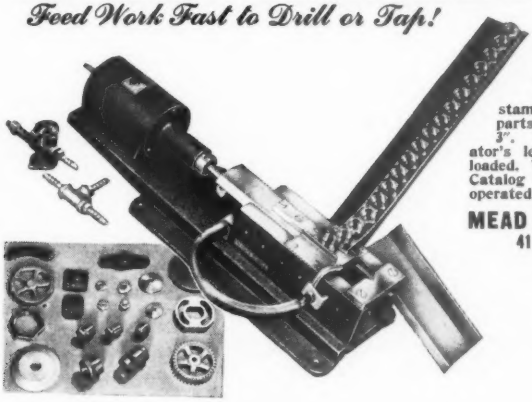
Acme Industrial Company
206 N. LAFLIN ST.
CHICAGO 7, ILLINOIS

WRITE FOR FREE CATALOG!

Boost Output with MEAD

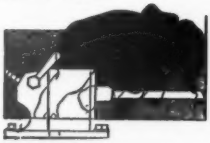
WORK FEEDERS

Feed Work Fast to Drill or Tap!



As - fast - as - you - can - step - on - a - button the sensational new Mead pneumatic WORK-FEEDER delivers holds, ejects small parts to be drilled, reamed or tapped. Accommodates stampings, castings, screw machine parts, etc. Adjustable to sizes up to 3". Foot or automatic control; operator's left hand is free to keep hopper loaded. Write for new Mead AIR POWER Catalog describing "Mead Family" of air operated fixtures and devices.

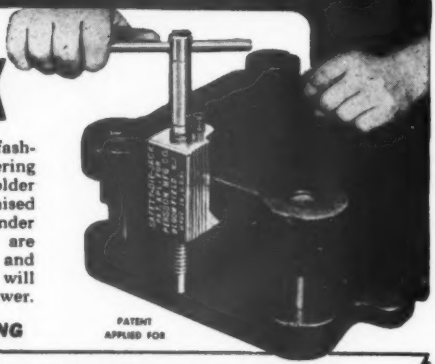
MEAD SPECIALTIES COMPANY
4114 N Knox Ave., Dept. HA-67
CHICAGO 41, ILL.



NOW YOU CAN SEPARATE AND ASSEMBLE DIE SETS..QUICKLY..EASILY..SAFELY!

with a PERSSON

DIE JACK



These Die Jacks eliminate old-fashioned, unsafe, prying or hammering methods. Just clamp on punch holder and turn handle. Punch holder is raised or lowered smoothly, always under control. PERSSON Die Jacks are precision built from fine steel and alloys—a tool every tool maker will want for his tool box or bench drawer.

NO PRYING • NO HAMMERING

PATENT APPLIED FOR

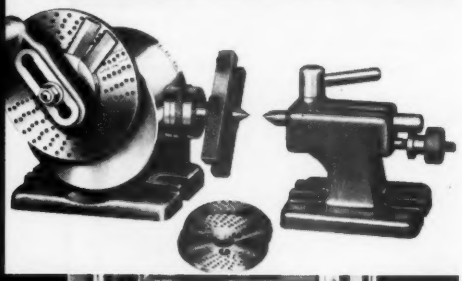
PERSSON MFG. COMPANY, 2 HENRY ST. BLOOMFIELD 4, N. J.

PROGRESS

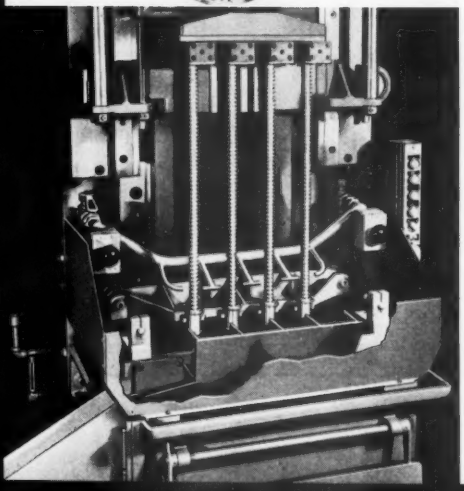
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

FOR FURTHER INFORMATION FILL IN KEY NUMBERS ON POSTAGE-FREE INFORM-A-GRAM INSERT

GIVING AUTOMATIC REVERSIBLE ACTION Trutest universal indicator features an indicator hand which always moves in the same clockwise direction. The contact finger may be swiveled to the desired angle without possibility of slipping; also the contact itself is attached by screw threads to prevent its dropping out. Built for long life, easy operation and accuracy, this instrument is available in two models from the B. C. AMES CO., Dept. 1-89, Waltham 54, Mass., or use INFORM-A-GRAM Key No. 189-Y.



WELL BUILT FOR ACCURATE WORK, the model SD 6½" Universal Dividing Head, newly added to the line of the L. W. Chuck Co., incorporates a ruggedly designed head and tailstock to withstand hard daily usage on smaller milling machines. The spindle has a tapered bearing and the head tilts to more than 90° in a vertical position. This new dividing head comes complete with three index plates for up to 380 divisions. Other details and specifications may be requested from L. W. CHUCK CO., 44 S. St. Clair St., Toledo, Ohio, or use INFORM-A-GRAM Key No. L17-Y.



AT THE RATE OF 630 PIECES PER HOUR, the Oilgear "XP-30 x 54" Stroke Vertical Pull-Down Broaching Machine will broach three splines in each of four workpieces at one pass. After the start button is pushed, pieces are automatically centralized by descending tools, broached and ejected into separate troughs (leading to a conveyor system) equipped with guides and lined with rubber to prevent parts from being marred. Positive, continuous pressure lubrication of tools and workpieces is exerted. The machine is shown broaching four bicycle coaster brake hub shells. Request other information from THE OILGEAR CO., 1362 W. Bruce St., Milwaukee 4, Wis., or use INFORM-A-GRAM Key No. E44-Y.

ON PARADE

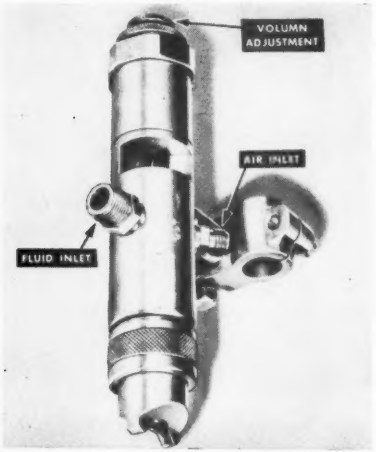
ESPECIALLY DESIGNED TO CHECK THE RELATIONSHIPS BETWEEN THE PITCH DIAMETER of a thread and the face of the part, the new Bryant Squareness-of-Face Gage, mountable on any Bryant Thread Gage, consists of a movable arm carrying a large dial indicator and two adjustable contact points. Doing a thorough inspection job in a short time, the inner contact serves as the pilot; the front contact actuates the dial indicator. Unskilled operation is possible as no "feel" is necessary for inspecting the threads or their squareness to the face. Available models cover capacities from 3/8" to 8" internal thread diameter. Inquiries should be directed to BRYANT CHUCKING GRINDER CO., Dept. 71, Springfield, Vt., or use INFORM-A-GRAM Key No. C71-Y.

OFFERING MAINTENANCE SOLUTION TO CARBIDE USERS. National Tool Salvage Co. announces improved facilities and additional staff specialists to handle the salvaging of tungsten carbide tipped cutters in a concentrated salvaging program of (1) education against damage, (2) regular inspection, (3) repair and (4) in some cases, alteration for adjustment to other uses. Request the illustrated catalog from NATIONAL TOOL SALVAGE CO., 6513 Epworth Blvd., Detroit 10, Mich., or use INFORM-A-GRAM Key No. 772-Y.

EXTREMELY FLEXIBLE, the Di-Acro Brake often replaces dies for simple or complicated forming operations, by duplicating intricate parts to a high degree of accuracy in a wide variety of materials. Standard blades may be easily replaced by special blades. Featuring accuracy, high production rate and long wear, this outfit will be further explained by O'NEIL-IRWIN MFG. CO., Dept. 20, Lake City, Minn., or use INFORM-A-GRAM Key No. 20-Y.

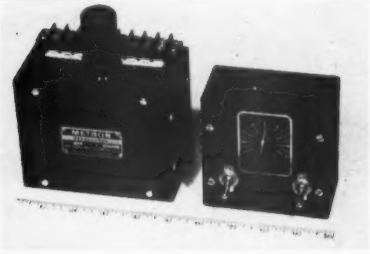
UNIFORM IN SIZE, CLEAN AND EFFICIENT. Elgin-processed diamond powder, found superior to Federal standards, gives a high finish without scratches or pit-marks. Free from non-working fines, this powder is colored for particle size identification. It is easily applied with a gun type applicator. Address SAPPHIRE PRODUCTS DIV., ELGIN NATIONAL WATCH CO., Dept. 89.5, Aurora, Ill., or use INFORM-A-GRAM Key No. C89.5-Y.

DESIGNED ESPECIALLY FOR SPRAYING LIQUID COMPOUNDS on buffing wheels, the new air-operated spray gun manufactured by the J. J. Siefen Co. is precision made and completely equipped with air pressure regulator, volume adjustment and easily controlled

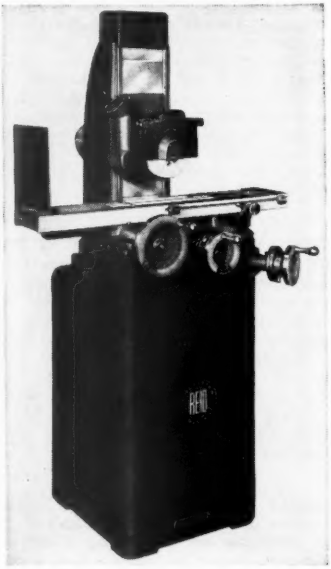


foot valve. "The Siefen Method of Spraying Buffing and Polishing Compounds" clearly explains the construction and operation of this spray gun. Request this booklet from J. J. SIEFEN CO., Dept. 11, 5657 Lauderdale Ave., Detroit, Mich, or use INFORM-A-GRAM Key No. L11-Y.

VERSATILE IN APPLICATION. Metron Welding and Industrial Timers provide timing intervals in one or several continuously variable ranges from 1/60 second, up to several minutes. Offering high timing accuracy unaffected by wide variations in line voltage or temperature, these units are dependable and long wearing, although very small and compact (the control box measures 4" x 4" x 2"). Additional information will be mailed upon request from METRON INSTRUMENT CO., 432 Lincoln St., Denver 9, Colo., or use INFORM-A-GRAM Key No. 391-Y.

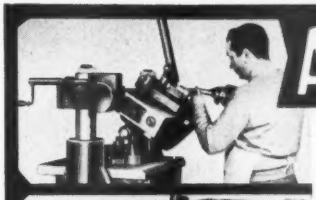


ASSURING CLOSE TOLERANCE AND FINE FINISH on tools, gages, dies, chasers, etc., this Reid Surface Grinder is especially designed for small work. Handy as an auxiliary machine, this Model No. 48 has a table feed hand wheel located at a convenient height for easy "wrist-action." Elevation is graduated by .0005" and cross feed by .001". This compact and versatile machine will be



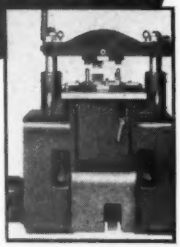
fully explained by REID BROTHERS CO., INC., Dept. 38, Beverly, Mass., or use INFORM-A-GRAM Key No. F38-Y.

ESPECIALLY SUITED TO THE PROBLEMS OF TUNGSTEN CARBIDE TOOLING, the Swiss-made GF Hydro-Copying Rigid Lathe is not traditional in form, actually being suggestive of a milling machine. Perfectly rigid to permit maximum cutting speed, this machine has a hydraulic copying system and vertical movement of tool, with the cutter edge to the rear, thereby directing chips away from the operator. Completely chatterless, the cutting tool will take cuts up to ¼" with a feed of 300 fpm. The workpiece is held between centers at each end and is driven by self-centering jaws. Several ac-



ALPHA

THE NEW DIE TRY-OUT PRESS



TRY DIES UNDER ACTUAL PRODUCTION CONDITIONS!

FINISH DIES WITHOUT REMOVING FROM PRESS!

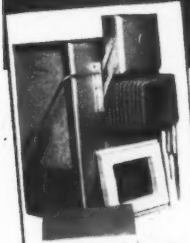
Saves time! Saves back-breaking labor! Increases accuracy! Cranks retract locating pins and tilt bolster and head so finishing work can be performed on either member of die. An accurate check on corrections is then possible since die returns to its original position.

Alpha is a production type press that brings to light necessary corrections that are not detected in regular try-out presses.

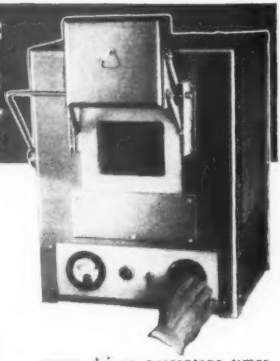
Write for literature and prices to Alpha Tool Works, 9281 Freeland, Detroit 27, Michigan.

NEW TEMCO ELECTRIC MUFFLE FURNACE

Model OFE . . . for Shop and Laboratory



● Muffle of ceramically bonded aluminum oxide is replaceable complete with nickel-chrome heating element or separate coiled heating element can be furnished for rewinding old muffle core.



SPECIFICATIONS

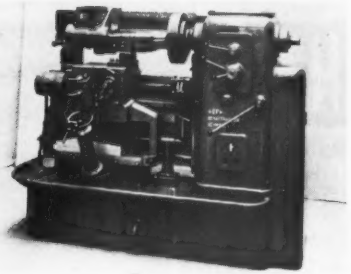
Size—Overall 22" x 34" x 18"
Muffle chamber 6" x 5" x 10"
Operating temperature
Continuous 1600° F.
Intermittent 1900° F.
Current consumption
2000 Watts maximum
Shipping weight 170 lbs.
Price—115V. or 230V. $194.00

A sturdy, modern electric furnace, with maximum convenience and economy in operation.

On the instrument panel is mounted a dependable pyrometer calibrated to 2000° F. and 1100° C., and a synchronous motor driven percentage timer which controls the current input. By turning the "TEMCO-TROL" knob the heating period is adjustable from 2% to 98% of a one minute cycle, giving close temperature selection over the full heating range.

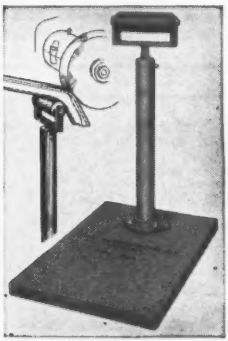
See your supply house or write

THERMO ELECTRIC MFG. CO., 474 W. Locust St., Dubuque, Ia.



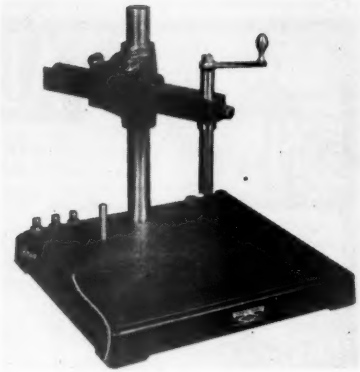
cessory tools are available for this lathe to facilitate internal copying. Get specifications and other details from U. S. Sales Representatives, COSA CORP., Dept. 2-50, Chrysler Building, New York, N. Y., or use INFORM-A-GRAM Key No. 250-Y.

POLISHING LONG, HEAVY PIECES EASILY AND QUICKLY is possible with the Presto Work Supporting Roller developed by The Manderscheid Co. The unit, consisting of a



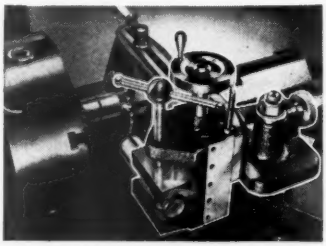
rubber roller mounted on a portable base, may be adjusted in height from 32" to 40" as desired. Additional specifications and details will be supplied upon request to THE MANDERSCHEID CO., Dept. 103, 810 Fulton St., Chicago 7, Ill., or use INFORM-A-GRAM Key No. B33-Y.

ADAPTED FOR BENCH PURPOSES, and easily adjusted for reaching any working point within the size of its table, the precision tapping machine developed by The Producto Machine Co. has a removable spindle with driving handle. Accommodating individual bushings for all tap sizes within the capacity of No. 4 to ¼, the machine weighs 65 lbs., has 15½" x 15" base. Write for further de-



tails to THE PRODUCTO MACHINE CO., Dept. 91, 960 Housatonic Ave., Bridgeport 1, Conn., or use INFORM-A-GRAM Key No. 91-Y.

FITTING IN WITH THE K-J ADAPTER BASE and quick-change system of lathe tooling, the milling attachment offered by the Kyle-Johnson Machine Co. is easily mounted on any engine lathe in a few seconds. Enabling the



operator to perform any light milling job, this tool is adaptable for use as a drilling vise. It is graduated by thousandths and has a vertical travel of 6". Built-in flexibility permits angle milling and tilting as desired. Request complete details from KYLE-JOHNSON MACHINE CO., Dept. 60, 1627 W. Pico Blvd., Los Angeles 15, Calif., or use INFORM-A-GRAM Key No. B60-Y.

CAPABLE OF MOLDING PLASTIC PIECES UP TO 32 OUNCES over a projected area of 150 square inches, the new machine in the Lester-Phoenix line of injection machines is their largest and has an injection pressure at the end of the plunger of 27,000 psi. The force is easily held in check by a normal mold locking pressure of 600 tons. Special features include vertical injection cylinder, die height adjusting screw with area equiva-

Buy KIPP AIR GRINDERS Because

The RPM's stay up while grinding... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. Every mechanic knows this, but inexperienced buyers may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
50,000 R.P.M.
$33.25
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

MADISON-KIPP CORP.
212 Waubesa St., Madison, Wis., U.S.A.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

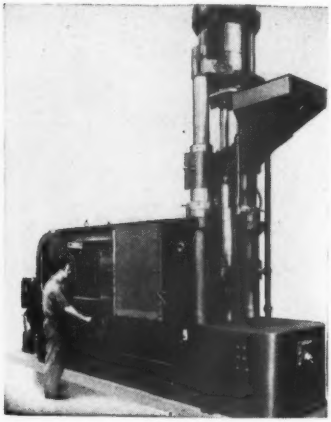
MODEL R-2

Three Dimensional PANTOGRAPH

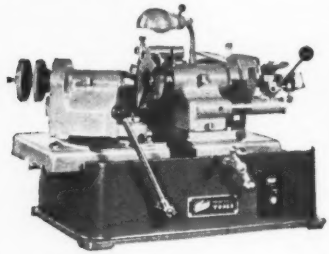
The Pierce R-2 Machine—for engraving, die sinking, profiling, milling. Simple in design, rigid in construction—yet sensitive, accurate, easy to operate. Special features include—a dynamically balanced spindle on a ball bearing pantograph, large and legible dials for micrometer adjustment, quick change from two to three dimensional operation, enlarging without extra equipment, extra wide range. For details, write:

Pierce Machine Tool Co.
617 W. Jackson Boulevard
Chicago 6, Illinois

lent to die area, automatic ejection and separate control of both injection speed and pressure. Request other information from LESTER-PHOENIX, INC., Dept. 4-25, Cleveland, Ohio, or use INFORM-A-GRAM Key No. 425-Y.



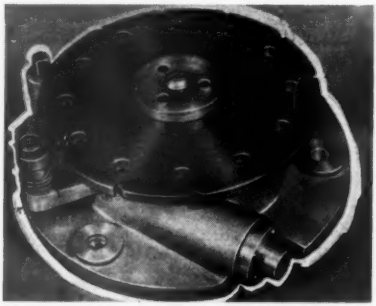
FEATURING A DUAL ELECTRIC MOTOR DESIGN, the new Thor Valve Refacer offers sturdy slide rods and solid balanced construction, combined to provide high precision valve refinishing. Also included is the Thor "4-in-1" butt end grinding attachment which provides settings for four operations; grinding the rocker arm, tappet, valve stem and dressing the wheel. For more complete material write INDEPENDENT PNEUMATIC TOOL CO., Dept. 22, 600 W. Jackson St., Chicago 6, Ill., or use INFORM-A-GRAM Key No. B22-Y.



UTILIZING THE BALANCED PISTON PRINCIPLE, the new hand-operated air valves, manufactured by Lindberg Engineering Co., are free from any mechanical connections between piston and operating levers. Easy cylinder control, which enables the cylinder to be stopped at any given point along the stroke, is possible when the three-position (forward, neutral, reverse) lever is in neutral.

Designed for a 175 lb. maximum working pressure, this unit is made of cast alloy aluminum with all inner parts of stainless steel and bronze. Get additional data from LINDBERG ENGINEERING CO., Dept. 3-69, Chicago 12, Ill., or use INFORM-A-GRAM Key No. 369-Y.

APPLICABLE FOR THE PUNCH PRESS, PRODUCTION MILLER AND DRILL PRESS, the new Allen Dial Table operates by means of compressed air. Employing a three-way air valve which controls the pawl arm by means of a piston, the table is indexed and locked automatically. All parts are designed for hard service, increased efficiency and reduced production costs. Request the new illustrated brochure from THE A. K. ALLEN CO., Dept. 8, 3011 Ft. Hamilton Parkway, Brooklyn 18, N. Y., or use INFORM-A-GRAM Key No. L8-Y.



CLOSELY REGULATING D.C. MOTOR SPEED FROM A.C. POWER to provide an almost flat speed torque curve unaffected by load changes, the new Federal electronic control will go into production this month. Designed in two models, the first, a general

Banish the spectre! Install the Hamilton Super Sensitive Tapping Machine, a specialist in precision tapping of small holes (from the smallest and finest tap to 10-32 inclusive).

Patented power transmission and adjustable stops permit tapping of blind holes to the very bottom without tap breakage. Spindle idles in reverse while tap is being centered. Pressure to feed lever changes spindle rotation. Release of pressure reverses and withdraws tap.

Get complete description and specifications. Write for Bulletin T-47.

SUPER SENSITIVE DRILLING AND TAPPING MACHINES • FORTELEVATORS

The Hamilton TOOL COMPANY

812 SO. NINTH STREET • HAMILTON • OHIO • U. S. A.

Quick Acting
JOHNSON
FURNACES

Treat high speed steels
Braze carbide tipped tools
Harden high carbon steels

JOHNSON Hi-Speed No. 120

Compact, powerful, and remarkably economical in operation. Reaches 1500° F. in 5 minutes. Delivers 2300° F. in 30 minutes. Easily regulated. Holds temperature at desired level for accurate heat treating *any* steel tools or dies. Gets the job done FAST to save time and gas. Firebox 5 x 7¾ x 13½.

Complete with Carbofrax Hearth, G.E. Motor, and Johnson Blower

$145.50
F.O.B.
Factory

There's a Quick Acting JOHNSON Unit for Every Toolroom.

FREE CATALOG . . . SEND COUPON

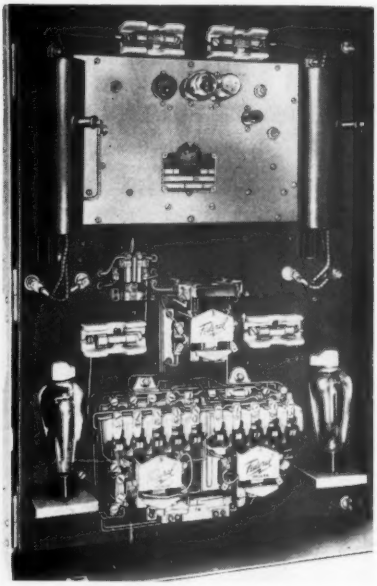
JOHNSON GAS APPLIANCE CO.
575 E Ave. N. W., Cedar Rapids, Iowa

Name _____

Address _____

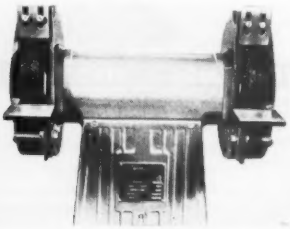
City _____ Zone ___ State _____

purpose, reversing type, is for application to a 2 hp, 230 volt d-c motor; the second is a special control for abrasive M-3 Surface Grinders. These controls automatically render precise current limits (regardless of



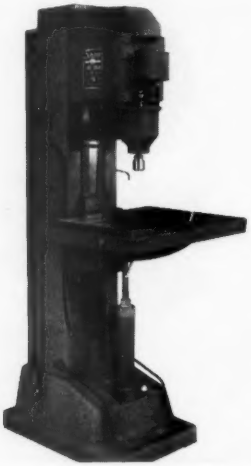
load) which makes it possible to preset the maximum armature current, thus giving stepless acceleration from standstill, as a protection for both the motor and control in case of overload. Full details are available from FEDERAL ELECTRIC PRODUCTS CO., Dept. 10, 50 Paris St., Newark 5, N. J., or use INFORM-A-GRAM Key No. L10-Y.

A SPECIAL SMALL-DIAMETER MOTOR is featured in the new type bench grinder which does away with all projections in the working area between the two grinding wheels and



permits unobstructed motion of the work as well as longer use of the grinding wheel. Available with 7, 8 or 10-inch wheels, one each of coarse and medium, these new grinders will be further explained by the manufacturer, BARDCO MFG. AND SALES CO., Dept. 92, 2450 E. 23rd St., Los Angeles, Calif., or use INFORM-A-GRAM Key No. K92-Y.

AIR OPERATED AND ELECTRICALLY CONTROLLED, the Snow Air Tool is the fundamental tool for use with the Snow Drill Press, Threading Machine, and Universal Tapping Machine. Operating at the touch of a button, this tool has an air-operated table raising and



lowering unit, a wide bale-type foot lever, cast aluminum air head with rust-resistant bronze cylinder walls and graphite carbon pistons, and well enclosed highly sensitive controls. The head can be synchronized with automatic, semi-automatic, or manually operated holding fixtures through the use of micro-switch actuated solenoid valves. Secure other material from SNOW MFG. CO., Dept. 94, 615 S. California Ave., Chicago, Ill., or use INFORM-A-GRAM Key No. K94-Y.

EQUIPPED WITH INTERCHANGEABLE ANVILS AND MOVABLE JAWS to accommodate a variety of sizes and shapes of work stock, the simple and versatile milling fixture, designed by Manufacturer's Engineering Service for production milling, eliminates the need for costly special jigs and fixtures, and is equally well suited as a work holder for tapping, drilling, reaming, deburring, spot facing, chamfering, and grinding. For automatic operation with a drill press, this fixture is

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Mac-it Hollow Lock Screws provide a locking arrangement that combines convenience with positive locking action. They lock as effectively after many thousand adjustments as they do the first time. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

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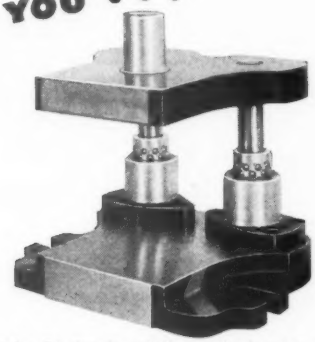

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Microlex Die Sets have ball or roller bearing guide pins which reduce die setter's time . . . enable you to get into production quicker . . . permit fast press speeds. Microlex Die Sets eliminate all down time caused by bound, scored or galled pins. Bearings have pre-load to prevent play between guide pins and bushings.

You don't have to wait to cash in on the profitable advantages offered by Microlex Die Sets. A large number of sizes are ready for immediate shipment.

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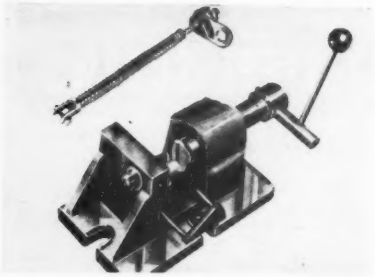
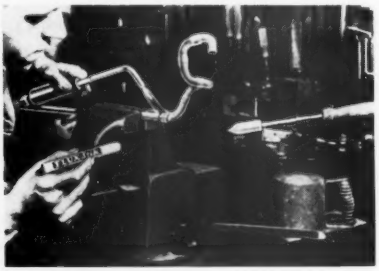


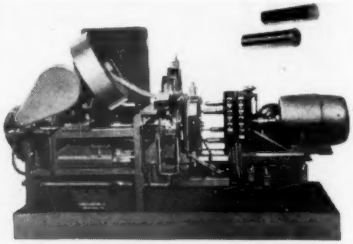
equipped with a lock-and-release rod. An informative catalog folder with construction specifications, features and advantages is obtainable from MANUFACTURER'S ENGINEERING SERVICE, INC., Dept. 97, 415 Security Bank Building, Toledo, Ohio, or use INFORM-A-GRAM Key No. K97-Y.

ALWAYS CLEAN AND READY TO USE, new Flux-Stik, which contains chemically advanced soldering flux, is convenient and efficiently used without messy containers, brush or stick applicators. Eliminating waste by



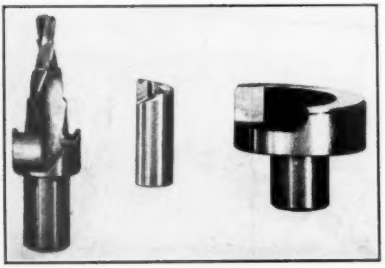
permitting just enough flux for the joint, Flux-Stik does not necessitate cleaning the metal, is non-running, and applicable to either hot or cold metal. Overhead and out-of-the-way soldering locations are easily reached with this new flux. Get other details from LAKE CHEMICAL CO., Dept. 96, 607 N. Western Ave., Chicago 12, Ill., or use INFORM-A-GRAM Key No. K96-Y.

PRIMARILY DESIGNED FOR DRILLING AND REAMING WRIST PINS, the Davis & Thompson Type HI-12 automatic machine is also adaptable to similar work varying in size and shape of part. Including two opposed drilling heads mounted on a common bed, this drilling and reaming machine employs a hydraulic indexing fixture. Workpieces are fed from a hopper automatically and held by direct chain clamping method. Its cycle is such that after the head drive hydraulic and coolant motors have been started and the start button pushed, it will continue in its rapid advance, feed and rapid return. Write to the manu-



facturer, DAVIS & THOMPSON CO., Dept. 21, Milwaukee, Wis., or use INFORM-A-GRAM Key No. 21-Y.

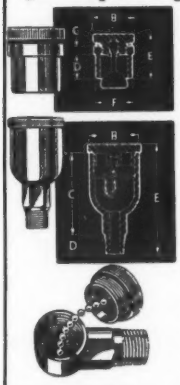
FORM GRINDING SPIRAL FORM TOOLS and spiral fluted form drills to customers specifications in a short time, the J. & S. Tool Co. uses a grinding technique developed over many years and equipment designed by their



own engineers. Thus eliminating high initial costs, strong, long wearing spiral form tools are no longer too expensive to wide usage. Request additional data from J & S TOOL CO., Dept. 3-39, East Orange, N. J., or use INFORM-A-GRAM Key No. 339-Y.

DESIGNED AND PRODUCED TO MEET ONE MANUFACTURER'S INDIVIDUAL NEEDS for a two-stage lapping machine on which both rough and fine, or finished, lapping operations could be performed, the Dual Roll Centerless Lapping Machine through popular demand has been added to the regular line of lapping machines produced by Size Control Co. Rough lapping is done on the left-hand roll; finished lapping on the right. And while greatly reducing lapping time, this machine will attain a finish of less than two micro inches. Secure more information from THE SIZE CON-

SCREW TOP OILERS
for Vapor-Tight Protection



- Covers Anchored—can't drop or lose.
- Tops gasketed for vapor-tight closure.
- Threads are die cut for snug fit.
- Knurled tops for convenient removal.

Styles "RS", "AS", "ASA" and "STG" Oilers, although standard stock items, are somewhat of a specialty. They are particularly adapted for revolving, mixing or agitating equipment—in food processing and similar applications requiring rigid sanitation—also for chemical and other industries having harmful vapors or excessive dust conditions. Available in a range of capacities. Ask for catalog No. 60 presenting complete line of lubricating devices.

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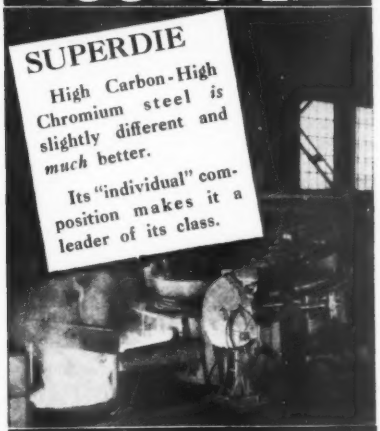
Exclusive for over 35 years

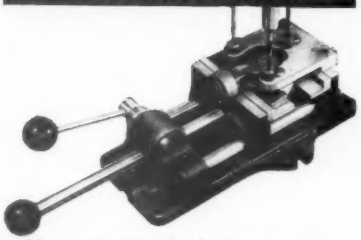
Columbia TOOL STEEL


SUPERDIE
High Carbon-High Chromium steel is slightly different and *much* better.
Its "individual" composition makes it a leader of its class.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. LLABAGE PRESIDENT
MAIN OFFICE AND WORKS

USE WORLD'S FASTEST VISE

CUT COSTS UP TO 75%
ON JIGS AND FIXTURES



You can stop the heavy expense and time losses common in the building of special jigs for drilling and light milling operations. Use the Heinrich "Grip-Master" as a base-structure. Built-in bosses and removable parallels permit easy attachment of bushing plates and locating jaws. You can speed up loading and unloading unbelievably, thanks to the large jaw openings of the "Grip-Master" and its revolutionary *screwless* feature.

WRITE FOR FULL FACTS!

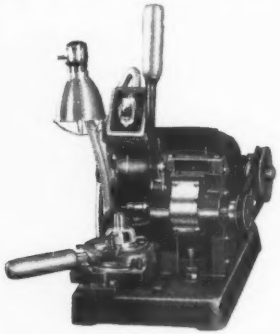
Ask your Mill Supply Dealer about the Heinrich "Grip-Master." If he does not yet have a stock, write for folder that fully illustrates and describes the money saving uses of this amazing tool.

HEINRICH
Grip-Master
DRILL PRESS TYPE
SCREWLESS VISE

NATIONAL MACHINE TOOL CO.
DEPT. 137-F, RACINE, WISCONSIN

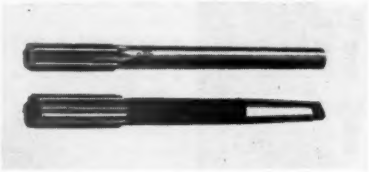
TROL CO., DIV. OF AMERICAN GAGE AND MACHINE CO., Dept. 40, 2500 Washington Blvd., Chicago 12, Ill., or use INFORM-A-GRAM Key No. F40-Y.

HIGHLY ADVANTAGEOUS IN FORMING THE BASIC FIXTURE for a tooling job, Rouse Hand Millers and Fixture setups often require only the addition of a final holding de-



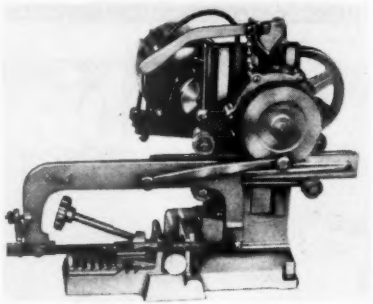
vice. Supplied together or as separate units, the Rouse Fixtures and Machines may be delivered to whomever is doing the tool work on a job, in order to promote uniform productivity. This compact unit will be further described upon request by H. B. ROUSE & CO., Dept. 1-06, 2214 N. Wayne St., Chicago, Ill., or use INFORM-A-GRAM Key No. 106-Y.

FEATURING TIPS RUNNING THE FULL LENGTH OF THEIR FLUTES, carbide tipped reamers now stocked by Super Tool Co, range from ¼" to 1½" in 32 sizes. Especially suitable when close tolerance and high finish are required, these tools will not freeze up in bushings due to galling and chips are pre-



vented from loading in the flute to score the finish—factors which explain the greater efficiency and longer life of this tool. Special data may be requested from SUPER TOOL CO., 21652 Hoover Rd., Detroit 13, Mich., or use INFORM-A-GRAM Key No. 168-Y.

SUITABLE FOR ALL SIZES OF SHOPS from the home work shop to the largest job shops and factories, the Standard Hi-Speed Power Hack Saw includes a lift and return stroke accomplished by a simple lever mechanism; ball



bearing guides for the saw frame; automatic cut-off switch and very rigid construction. Two models are available: No. 3 with 6" x 6" capacity, 14" power blade and integral coolant pump; and No. 2, 4" x 4" capacity, 12" blade, is a dry cut saw. All inquiries should be addressed to T & S ENGINEERING CO., Dept. 13, 15 N. Euclid Ave., Pasadena, Calif., or use INFORM-A-GRAM Key No. L13-Y.

DRILLING, BORING, CHAMFERING, spotfacing, reaming and tapping operations are combined efficiently in a completely automatic cycle on the special machine designed and built by the Snyder Tool & Engineering Co. for 22 machining operations on cast iron steering gear housings. One housing is completed every 50 seconds, using both high speed steel tools cutting at 90 fpm and tungsten carbide tools at 240 fpm. Further de-

DEEP-HOLE DRILLING

We are especially equipped to drill deep holes from 3/16" to 1½" in diameter.

Send us your part prints for estimate

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(Deep-Drilling Division)
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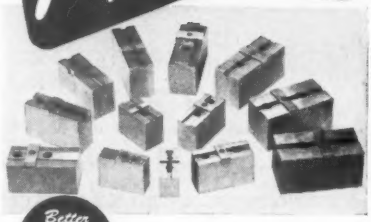
Jergens **FIT 270 STANDARD CHUCKS**



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Jergens Standard Sott Chuck Jaw Blanks are precision engineered to fit a total of 270 standard chucks. Immediate shipment from our Cleveland stock. We invite inquiries on your *tailored* jaw requirements.

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You can do any of these jobs
FASTER-EASIER-BETTER
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Grinding • buffing • polishing • sanding • drilling reaming • rotary filing • wire brushing • screw driving nut setting • wood filler rubbing • rasping

M-5

Strand machines provide PORTABLE rotary power at CONSTANT speeds with dependable results and less operator fatigue. Ruggedly built for years of steady use. Hundreds of attachments easily interchanged—125 types and sizes—vertical and horizontal models from ⅛ to 3 H.P.

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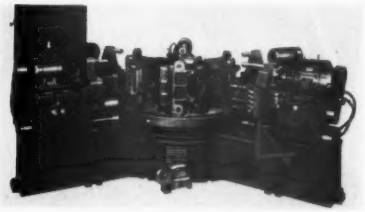
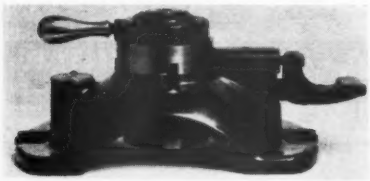
tails and specifications about this special machine and other machines built to suit



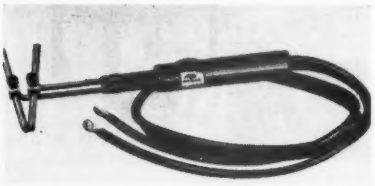
specific needs may be requested from SNYDER TOOL & ENGINEERING CO., Dept. 4-66, 3400 E. Lafayette Ave., Detroit 7, Mich., or use INFORM-A-GRAM Key No. 466-Y.

SPEEDING UP THE MACHINING OF PIECES requiring several similar operations, the G & H Indexing Collet Fixture is mountable at any angle on a wide variety of machines, quick



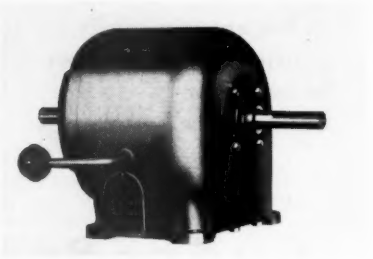
acting for easy setup, fast indexing and self-cleaning. Its chatter-free operation under all conditions is assured by rugged and precise construction. Interchangeable index plates permit it to be employed on an unlimited number of jobs. Get more specific details from G & H MFG CO., Dept. GH-2, 327 Elm St., Fitchburgh, Mass., or use INFORM-A-GRAm Key No. L5.5-Y.

JUST A TOUCH OF THE THUMB TO THE SLIDE BUTTON on the new "Knock-Out" Arc Torch provides immediate make-and-break of the arc flame. Shock proof, this torch will not "flash" when laid down and is safe for adjustment or replacing of carbons. Light weight and easily handled, it uses 3/8" and



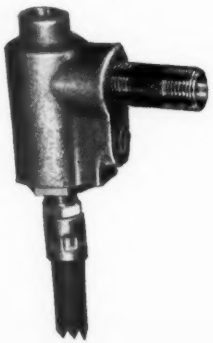
1/4" carbons interchangeably without adapters. Get more details and specifications from the K. O. LEE CO., 1115 First Ave., S. E., Aberdeen, So. Dakota, or use INFORM-A-GRAM Key No. 361.5-Y.

ADAPTABLE TO ANY STANDARD MOTOR OF 1/4 HP TO 1 HP RATING, the new Lima Type RD separate selective speed gearshift drive offers gear ratios of 1 to 1, 1.33 to 1, 2 to 1, and 4 to 1. Small and compact, this



unit includes a unit cast gear box and permanently lubricated gears and bearings to assure trouble-free service. Operating in either rotation direction, the Type RD offers a choice of four positions for the shift lever. Inquiries should be directed to THE LIMA ELECTRIC MOTOR CO., 801 Findlay Rd., Lima, Ohio, or use INFORM-A-GRAM Key No. 571-Y.

BUILT TO SPEED-UP AIR CYLINDER TRAVEL per minute, the Bryant Automatic Air Valve lets air into the cylinder, as well as opening for exhaust when the three-way valve



is operated. This valve will speed-up cylinders from 50% to 200% depending on how far the operating valve is from the cylinder. Made to match the operating valve, the auto-

LUFKIN INSIDE MIKES IN COMPLETE SETS

Head will measure down as small as 1½ inches.
Write for free catalog.
BUY THROUGH YOUR DISTRIBUTOR.

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THE LUFKIN RULE CO.,
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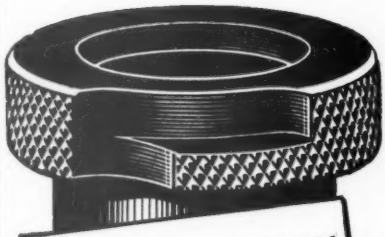

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CLARKATOR CHECKS DIAL INDICATORS

MASTER DIAMOND CHECKING SET

CLARK

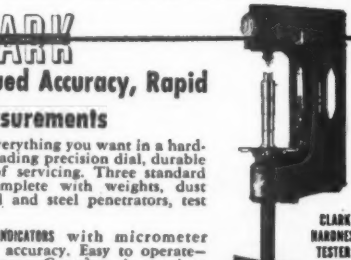
Gives Continued Accuracy, Rapid Measurements

THE CLARK has everything you want in a hardness tester—direct reading precision dial, durable construction, ease of servicing. Three standard models shipped complete with weights, dust protectors, diamond and steel penetrators, test blocks, and anvils.

CLARKATOR CHECKS DIAL INDICATORS with micrometer speed and sine bar accuracy. Easy to operate—just four simple steps. Complete instructions permanently fastened to base.

MASTER DIAMOND CHECKING SET eliminates hardness tester errors. Consists of a master diamond penetrator and two test blocks. Precision is assured over a long period because the set is used only for checking. Furnished in leather case.

Learn the truth about hardness testing! This 20-page reference manual (right) contains information on history, theory, practice, and equipment for modern hardness testing. Available to executives without charge. Write Dept. MMS today!

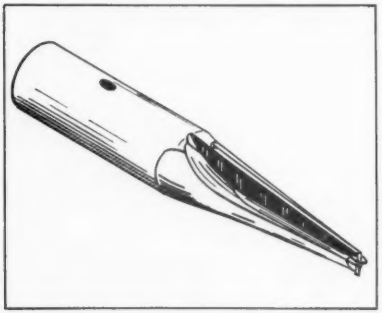


CLARK HARDNESS TESTER

CLARK INSTRUMENT, INC.
10200 Ford Road. • Dearborn, Mich.

matic valve is tapped correspondingly. Request additional information from BRYANT PRODUCTS CO., Dept. 73, Jackson, Mich., or use INFORM-A-GRAM Key No. K73-Y.

DESIGNED TO GIVE POSITIVE, EXCEPTIONAL CLEARANCE while cutting, the Melin Tapered Die Sinking Cutter has a raised cutting edge which eliminates rubbing and overheating and minimized breakage.

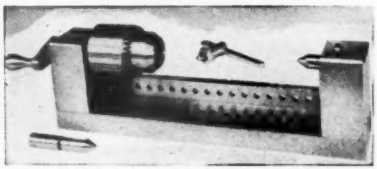


Also simplifying resharpening, this raised cutting edge permits three to five resharpenings before it is necessary to regrind back clearance. Triple drawn for long life and extra toughness, these high speed tools are available in 3°, 5°, 7° and 10° tapers, with standard straight shanks and square or ball end, from MELIN TOOL CO., Dept. 109.5, 3370 W. 140th St., Cleveland 11, Ohio, or use INFORM-A-GRAM Key No. 109.5-Y.

COMBINING THE ADVANTAGES OF BOTH WELDING AND METALLIZING PROCEDURE, the Colmonoy Spraywelder, for use with the Colmonoy Sprayweld process, is used both to

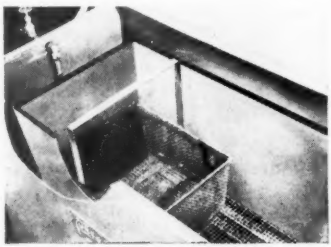
apply a uniform overlay of hard-facing alloy and then as a conventional welding torch to fuse the sprayed metal to the base metal, thereby obtaining the same molecular bond obtained with acetylene welding, using the alloy in rod form. Light weight, simply constructed and durable, this unit will also handle compositions other than Colmonoy alloys equally well. Request additional data from WALL-COLMONOY CORP., Dept. 8-49, 19345 John R St., Detroit 13, Mich., or use INFORM-A-GRAM Key No. 849-Y.

DEVELOPED FOR VERSATILITY, the "Whirlijig" will grind tapers, reamers, counterbores, broaches, drills, pins, screw ends and radii on stock; resharpen cutters and end mills; reduce stock diameters; touch up lathe



and grinding centers; and put lead on taps, plus unlimited individual production uses to which it is adaptable. Cutting costs as it speeds up production, this unit is adjustable by changing two Allen screws; will accommodate male or female centers and is precision made and absolutely square on all sides. Get additional data and specifications from JERRY LIND, Dept. 18, 1605 Ferris, Royal Oak, Mich., or use INFORM-A-GRAM Key No. L18-Y.

UTILIZING AN ENTIRELY NEW PRINCIPLE, the automatic multi-flow Turco Turbulator Tank cleans parts with a combined liquid scrubbing and solvent action. Compressed



air induces flow of liquid and cleaning compound is forced under pressure through and around parts. Fast and efficient, this tank is made in four models handling the smallest to the largest parts. Write to TURCO PRODUCTS, INC., Dept. 54, 6135 S. Central Ave., Los Angeles 1, Calif., or use INFORM-A-GRAM Key No. E54-Y.

THE NEW AIR-OPERATED

ALLEN
DIAL FEED TABLE

For Use with PUNCH PRESS, DRILL PRESS, PRODUCTION MILLER, SPOT WELDER, etc.

Recommended for assembling, punching, machining of nuts, stampings, etc.

MODEL A—A 3-way valve, actuated by some motion from the machine to which the table is to be synchronized, allows compressed air to move a hardened and lapped piston to operate the Pawl arm. The Pawl indexes the plate and LOCKS it in the indexed position until the valve is released allowing a spring to return the Pawl, ready for the next indexing.
List $125.00 F.O.B. Brooklyn, N. Y.

MODEL B—This model is an adaptation of Model A wherein a special control valve is incorporated so that the plate is automatically self-indexing. By merely turning a screw, speed is adjustable from one indexing each half second to one each ten seconds. The table is locked in position between indexings. Recommended for soldering, assembly, etc., operations where no mechanical motion is available.
List $155.00 F.O.B. Brooklyn, N. Y.

SPECIFICATIONS

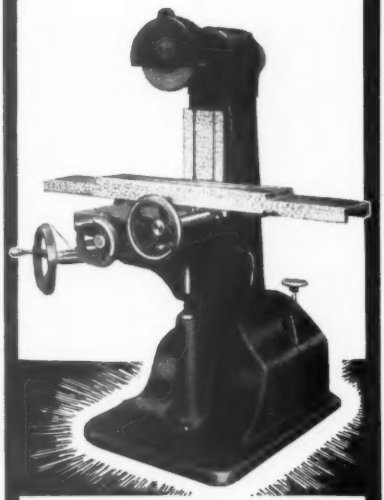
Diameter of Index Plate .....7¼"
Height from base to top of Index Plate .....2-15/16"
Standard 12-position Index Plate
All working parts hardened

Write for Literature

Inquiries invited from Air Equipment Dealers

A. K. ALLEN CO.
3011 FT. HAMILTON P'KWAY
BROOKLYN 18, N. Y.

NO. 11 LEACH SURFACE GRINDER



EXTRA LARGE CAPACITY
6" x 24" x 12"
HEIGHT 52"
WEIGHT 850 lbs.
2 SPINDLE SPEEDS
2600 and 3500 R.P.M.

$650.00

Complete with motor of standard Current characteristics F. O. B. Factory.

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EASY to USE

TU-MI-CO TUBULAR FRAME of special homogeneous grain structure steel is 25 to 50% lighter than solid frame—yet highly shock resistant. Lessens fatigue.

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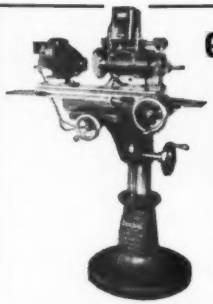

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The men who operate them say "The Greenfield Universal Grinder is universally preferred."

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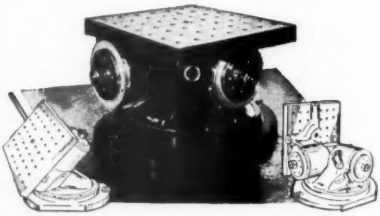

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Saves about 50% of time formerly consumed in set-up of work. Can be used on milling machine, shaper, jig borer, drill press, etc., to lay out, machine, and check work without removing work from plate. Can also be used as a 90° angle plate on the machine or on the surface plate. Holds work in any position from 0° to 90° in two planes, 90° apart, and in any position within 360° of the radial axis. The surface plate, from a position parallel to the base, may be tilted 90° in two directions and also rotated 360° on the base. Each of three protractors (two 5" and one 10" diameter) are calibrated to 1 minute and accurate within 10 seconds of the arc. Write for Bulletin No. 4. Angle Computer Co. (Dept. TD-8), 1709 Standard Avenue, Glendale 1, Calif.

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PUBLICATION PREVIEWS

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DESIGNED FOR HIGH PRODUCTION LAPPING of moderate and small size gears, the improved Michigan 2-lap Gear Lappers, automatic in operation, are provided with electrical controls which permit adjustment of the lapping cycle to meet virtually every possible variation desired. The Michigan crossed-axis principle and the fast reciprocating motion on which the laps operate are discussed in Bulletin 995-47 with complete specifications of the machine included. Write to MICHIGAN TOOL CO., Dept. 47, 7171 E. McNichols Rd., Detroit, Mich., or use INFORM-A-GRAM Key No. 47-Y.

DESCRIPTIONS OF 25 REPRESENTATIVE DIAMOND TOOLS made by Diamonds & Tools, Inc. are contained in a recently published 4-page bulletin. Actual photos show tools in Colmony alloy settings which hold the diamond rigidly, resulting in more precise work and fewer lost stones. Facilities for designing and making diamond tools for special applications are available. Further details can be requested from DIAMONDS & TOOLS, INC., Dept. 3, 19345 John R St., Detroit 3, Mich., or use INFORM-A-GRAM Key No. J28-Y.

FOR CARRYING AWAY DUST-LADEN AIR around grinding, cutting and polishing wheels, Torit dust collectors, self-contained units, protect valuable machinery from abrasive dust and grindings. Recent literature shows a cut-away view giving details of construction and how they operate. Various models are illustrated with suggested applications and typical installation. Accessories and district representatives are also listed in this catalog No. 32 available from TORIT MFG. CO., Dept. 4-94, Walnut and Exchange Sts., St. Paul 2, Minn., or use INFORM-A-GRAM Key No. 494-Y.

SOLUTIONS TO DRILLING, BORING AND TAPPING PROBLEMS are contained in the National Automatic Tool Co., Inc. general catalog 146. Engineering service is offered, description of a complete line of machines and their adaptability to various materials and work are discussed and illustrated. Recommendations for selecting production machine tools and when to consider specially designed machines are given. Request copies from NATIONAL AUTOMATIC TOOL CO., INC., Dept 69, Richmond, Indiana, or use INFORM-A-GRAM Key No. E69-Y.

CONSTANT POWER IN A PORTABLE TOOL is offered with Circle Ess flexible shafts. Designed for heavy, medium and light duty work on all types of metals, plastics, porcelain and wood, they can be applied in hundreds of finished operations. A high speed, light weight, flexible shaft kit, to meet the demand for a wide range of applications and quick change of speed, is also described in a bulletin obtainable from F. W. STEWART MFG. CORP., Dept. 4, 4311-13 Ravenswood Ave., Chicago 13, Ill., or use INFORM-A-GRAM Key No. L4-Y.

AN AID TO ORDERING STOCK AND SPECIAL GEARS for industrial use, Catalog No. 62, issued by Grant Gear Works, is cross indexed with information on gears, bakelite pinions, chains and reducers. Diagrammatic sketches, with hints on computing sizes of gears and various charts, are also given. Secure this handy catalog and price list from GRANT GEAR WORKS, INC., Dept. 2, Second and B Sts., Boston, Mass., or use INFORM-A-GRAM Key No. L2-Y.

SELECTIVE SLIDING GEAR TRANSMISSION, the Turner Uni-Drive, equipped with 3-4-6 and 9 speeds, provides the proper speed for any job; makes machines more versatile. For milling machines, lathes, shapers and special applications, the unit has all the advantages of a geared head with belt drive smoothness. Ask for descriptive pamphlet giving data and speeds and correct models for standard machines from TURNER UNI-DRIVE CO., Dept. 5, 3416 Terrace St., Kansas City 8, Mo., or use INFORM-A-GRAM Key No. C5-Y.

COMPREHENSIVE VALUABLE INFORMATION PERTAINING TO CUTTING TOOLS is offered in the latest catalog issued by Melin Tool Co., Inc. A portion of the book contains the complete line of standard tools which are carried in stock for immediate delivery, together with specifications and price list; also a reference of various types of special tools. The remaining portion contains suggestions on the use and care of end mills; table of cutting speeds and feeds; approximate hardness con-

version table, decimal equivalents of regular sizes; metric and English equivalent measures; fraction, decimal and metric equivalent drill sizes, following in consecutive decimal order, letter sizes starting at .2340; other charts and figures complete this handy informative catalog. Address requests to MELIN TOOL CO., INC., Dept. 1-09, 3370 W. 140th St., Cleveland 11, Ohio, or use INFORM-A-GRAM Key No. 109-Y.

QUICKLY INSTALLED ON ANY PUNCH PRESS, model D Pneumatic die cushions are self contained portable units which can be applied to advantage on dies already in use in place of springs or rubbers. Adaptable to drawing, compound blanking and piercing operations as well as knockout, ejector, and die pressure pad actions and control. Complete facts and sketches showing quick setup are given in a four-page bulletin. Write to DAYTON ROGERS MFG. CO., Dept. 6-19, 2835 12 Ave., Minneapolis 7, Minn., or use INFORM-A-GRAM Key No. 619-Y.

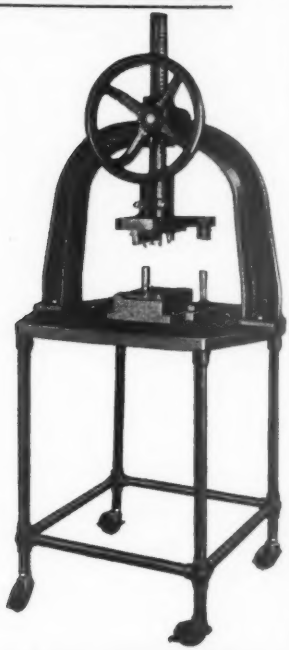
ERRORS ARE READ QUICKLY, EASILY AND ACCURATELY with the Pratt and Whitney electrolimit height gage, a precision instrument designed for use in inspection rooms, toolrooms and throughout many shops. Circular No. 486 presents many features and data of its construction, adaptability for checking and comparing dimensions and its portable instrument cabinet. The gage is available in two sizes of stands: No. 1 with 12" column and No. 2 with 24" column. Obtain copies from PRATT AND WHITNEY, DIVISION NILES-BEMENT-POND CO., Dept. 4-30, W. Hartford 1, Conn., or use INFORM-A-GRAM Key No. 430-Y.

A WIDE RANGE OF MACHINING OPERATIONS are offered in the Kaukauna series 125 portable horizontal drilling and tapping machines, which can drill and tap at any conceivable angle in any plane within the maximum and minimum limits of travel or movement of the machine unit. A 22-page illustrated bulletin describes three series 125 units showing many operational views of the various possible head positions; specifications are included. Request copies on company letterhead from KAUKAUNA MACHINE CO., Dept. 86, Kaukauna, Wis., or use INFORM-A-GRAM Key No. K86.5-Y.

BUILDERS OF SPECIAL MACHINE TOOLS. The Cross Company has issued a new booklet which explains in photographs and diagrams the "60" series machines, for pointing and chamfering spur, helical and bevel gears;

also splines. Explanation of the actual generating action utilized in the continuous rotary cutting motions and importance of economical and accurate cutter maintenance, using the crush wheel process, are contained in this informative booklet. Send requests to THE CROSS COMPANY, Dept. R.L.M., 3250 Bellevue Ave., Detroit 7, Mich., or use INFORM-A-GRAM Key No. L16-Y.

COMPLETE THE DIE-SET AT YOUR BENCH



LACEY DIE-SET MACHINE

Here is a truly "one man" press that operates with one hand and under full manual and visual control.

Handy for tool and press rooms, it permits the diemaker to complete a die-set *right at his bench* . . . saves tool room and handling costs.

Positive, true punch-to-die alignment is assured at all times, thanks to the Lacey's sturdy, open construction. And punches can be removed as often as needed without disturbing alignment once the die-shoe is clamped to the table and punch holder fixed in position in the ram. No pry bar or hammer is needed to separate punches.

The Lacey Die-Set machine is sensitive for delicate work yet rugged enough for fitting up heavy die-sets. Useful, too, for shearing certain types of punches.

Write today for complete details.

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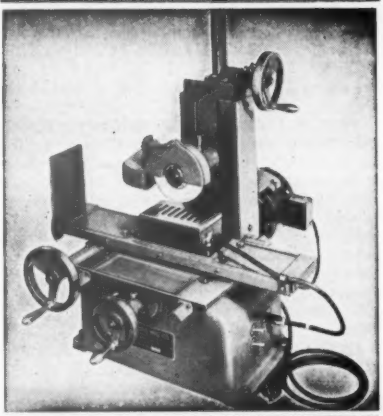

High-Speed BENCH SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed *"For the job that fits in your palm."*

Write for bulletin on this Model SG and also new, larger Model MG.

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PUBLICATION PREVIEWS

TIME-SAVING BENCH MACHINES FOR INDUSTRIAL AND HOME SHOP USE are reviewed in an 8-page bulletin issued by Benchmaster Manufacturing Co. An inclinable punch press that stamps, crimps, marks, punches, rivets and forms is illustrated, as well as a group of milling machines that can be easily converted from vertical to conventional horizontal models. Secure this bulletin for complete specifications and a list of accessories from BENCHMASTER MANUFACTURING CO., Dept. TDJ-6, 2952 W. Pico Blvd., Los Angeles 6, Calif., or use INFORM-A-GRAM Key No. 169-Y.

FASTER FINISHING OF MULTI-MACHINED PRECISION PARTS can be facilitated by the G & H collet type indexing fixture. Quick acting for easy setup and fast indexing, the new fixture can be mounted at any angle on a wide variety of machines, its rugged construction insuring chatter free operation at all times. Detailed features of speed, accuracy, versatility and economy are discussed in a recent pamphlet, available from G & H MFG. CO., Dept. GH-2, 327 Elm St., Fitchburg, Mass., or use INFORM-A-GRAM Key No. L5-Y.

EXPANDING MANDRELS FOR TURNING, GRINDING AND MILLING OPERATIONS on the production line, tool room maintenance and repair shop, allow an accuracy of .001 or better. These "knock-out" mandrels will hold any work, from thin sleeves and bushings to heavy castings and forgings with ⅜" to 5½" hole. Made in two series: general purpose, with fast taper and heavy duty series, with slow taper. Illustrated data may be requested from K. O. LEE CO., 1115 First Ave., S. E., Aberdeen, S. D., or use INFORM-A-GRAM Key No. 361-Y.

A THREE-WAY VERTICAL HYDRAULIC UNIVERSAL MACHINE, adaptable to push, pull and surface broaching operations, is described in circular 100, issued by American Broach and Machine Co. Diagrammatic sketches and photos of the outstanding features emphasize its ease of operation, high productivity and flexibility in application. Sizes range from 4 to 8 tons with 24" stroke and 6 to 15 tons with 35" stroke. Write to AMERICAN BROACH AND MACHINE CO., DIVISION OF SUNDSTRAND MACHINE TOOL CO., Dept. 7-08, 411 W. Huron St., Ann Arbor, Mich., or use INFORM-A-GRAM Key No. 708-Y.

HOW TO SELECT AND ORDER KENNAMETAL CEMENTED CARBIDE PRODUCTS is supplemented by catalog 47, recently issued by Kennametal, Inc. Illustrations of standard and special tools simplify selection of clamped-in solid round tools, tools having clamped-in blades, internal radius tools and blanks, axial face Kennamills, saws and router bits, Kennadrills for masonry and standard solid Kennametal rolls. This informative 64-page catalog with noteworthy applications of a wide variety of Kennametal is available from KENNAMETAL, INC., Dept. 33, Latrobe, Pa., or use INFORM-A-GRAM Key No. 33-Y.

RECOMMENDED FEEDS AND SPEEDS FOR CROBALT, an improved cast, non-ferrous high-speed cutting alloy, which does not lose its superior cutting quality until the alloy is heated well above 2000 degrees, are given in a six-page folder offered by Crobalt, Inc. Sizes and price lists of standard square and rectangular tool bits, with on-the-job illustrations and sketches of series "T" solid cast insert blades to fit standard cutter bodies, complete the folder. Obtain copies from CROBALT, INC., Dept. F, 1354 N. Main St., Ann Arbor, Mich., or use INFORM-A-GRAM Key No. 107-Y.

HOW "CONTROLLED-AIR" POWER DEVICES REPLACE REPETITIVE MANUAL OPERATIONS and cut costs as much as 50% or more is cited with typical examples in Bulletin CL-10, issued by The Bellows Co. These unique power units will take the "human element" out of a job—cutting operator fatigue to a minimum. "Controlled-Air" powered motors, feeding units, electrically controlled powered feeds, semi-automatic air vise, hydrochecks and "Power-Dome" air cylinders and control valves are illustrated and described in the bulletin. Write for copies to THE BELLOWS CO., Dept. 8-39, 861 E. Tallmadge Ave., Akron, Ohio, or use INFORM-A-GRAM Key No. 839-Y.

TO EXPEDITE PRODUCTION, new tangent chaser die heads assure quick, simple removal and replacement of chasers and chaser holding blocks, usually without removing the tool from the machine. These die heads are

SEE BETTER with a MAGNI-FOCUSER

The Best Eye Aid for

- LATHE WORK
- BENCH WORK
- SAW FILING
- REWINDING MOTORS
- TOOL AND DIE WORK

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EVERYONE in your plant who does precision work can do it *easier, faster, safer, better* by wearing a Magni-Focuser. This *binocular* eye-loop enables you to see an object *sharply magnified* with the comfort and clarity of normal vision. Relieves eye-strain—lessens fatigue—reduces accidents. *Allows free use of both hands.* Available in different magnifications, from 2¼ at $8.50 to 3½ at $10.50. If your distributor cannot supply you, order direct. Money refunded if Magni-Focuser does not help you to *see better.*

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PRECISION BROACHES

Manufacturers of standard and special broaches. A complete service for sharpening, reconditioning and converting broaches. Standard keyway broaches in stock.

Dependable—Prompt Service

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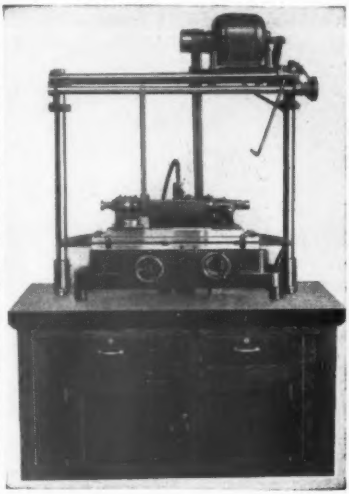
Attention!
TOOL and DIE SHOPS and MANUFACTURERS



Here are some facts about increased Die Production:

Your piercing punches are the main factor in Die Performance. *Grinding* these punches to a *Mirror Finish* guarantees more accuracy for longer production runs; decreasing punch wear due to firing or galling.

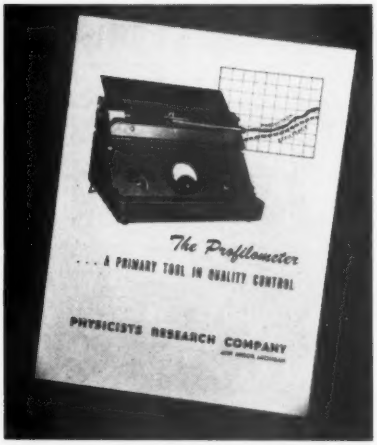
***Grinding* cuts Die costs and maintenance to a minimum. Insures punch replacement concentricity between punch, body and accuracy of size.**

Ask us about information on your Grinding problems. Factory trained men at your service.

CRYSTAL LAKE GRINDERS
CRYSTAL LAKE, ILLINOIS
SINCE 1910

furnished in revolving and stationary type, with chasers and holding blocks interchangeable. Complete details are available from MURCHEY MACHINE & TOOL CO., Dept. 4-06, 950 Porter Ave., Detroit, Mich., or use INFORM-A-GRAM Key No. 406-Y.

FOR MEASURING SURFACE ROUGHNESS IN MICROINCHES, a new illustrated catalog reviews Profilometer equipment offered by Physicists Research Company. The direct-reading Profilometer, the manually-operated general-purpose type MA Tracer and the complete line of accessory tracers for measuring



in extra-deep holes, on small ID's, on gear teeth and in narrow slots and grooves, are described in the catalog. In addition to specifications and prices, there is an introductory section discussing the application of equipment in the shop to various production and quality control problems directly related to surface roughness. Request copies from PHYCISISTS RESEARCH COMPANY, Dept. 7-73, 321 S. Main St., Ann Arbor, Mich., or use INFORM-A-GRAM Key No. 773-Y.

ESPECIALLY DESIGNED FOR GRINDING GLASS, SAPPHIRE, cemented carbides and all other hard abrasive materials, thin-walled sintered bonded diamond wheels, produced by a "steel-set" process, insure ruggedness and long life, speed and economy. The diamond particles are specially coated to insure an extra strong gripping action by the sintered steel bond, so that they are used to completion and are not pulled out prematurely from the matrix. Recent literature lists eight types of wheels, a diagrammatic sketch, stock sizes and suggestions on ordering. Request literature from FISH-SCHURMAN CORP., Dept. 7-61, 230 East 45th St., New York 17, N. Y., or use INFORM-A-GRAM Key No. 761-Y.

SPECIALISTS IN GRINDING MILLING CUTTERS, end mills, drills, reamers, center drills, and taps, the Rutland Tool Service announces the opening of a new department for the salvaging of tungsten carbide tipped cutters. This department supplements a complete tool reconditioning service for all types of high speed cutting tools rendered by the company. Literature containing further details is available from RUTLAND TOOL SERVICE, Dept. 16, 13006 Greeley Ave., Detroit 3, Mich., or use INFORM-A-GRAM Key No. A16-Y.

SCIENTIFICALLY BLENDED OF PRIMARY INGREDIENTS, rubber, abrasive grains and polishing substances, Cratex soft rubberized abrasive and polishing products are carefully tempered to insure the maximum of long and active wear in service. Assortments of abrasive and polishing wheels and points, blocks and sticks, cones, lap wheels and ring buffs for fine grinding and polishing are illustrated with recommended speeds, application, and available sizes, in recent literature obtainable by writing CRATEX MANUFACTURING CO., Dept. 21, 81 Natoma St., San Francisco 5, Calif., or use INFORM-A-GRAM Key No. E21-Y.

A FACTUAL STORY OF THE BUNELL COMPANY, manufacturer of special machines, special tooling and dies, is presented in an interesting 32-page Bulletin 471. The history of the company, its policy, experience, motor driven equipment, what the company has to offer in designing and building of special machines, equipment, tools, dies, jigs, and fixtures as well as general machining facilities and production contract service are discussed with illustrations of on-the-job scenes. Get this bulletin from THE BUNELL MACHINE & TOOL COMPANY, Dept. 8-86, 1601 East 23rd St., Cleveland 14, Ohio, or use INFORM-A-GRAM Key No. 886-Y.

FOUR TYPES OF STEAM HEATING COILS, steam, booster, return bend and double tube, are thoroughly discussed in Bulletin No. B-1218, published by American Blower Corp. References of physical data, steam heating ratings, selection examples, condensate loading, air friction and typical specifications are given. Piping diagrams and illustrations of construction details and design features are also aids in determining proper selection and application of these steam heating coils. Copies are available from AMERICAN BLOWER CORP., Dept. 14, Detroit 32, Mich., or use INFORM-A-GRAM Key No. L14-Y.

SUGGESTIONS TO PURCHASERS OF A. S. A. STANDARD DRILL JIG BUSHINGS are contained in Catalog 446, giving a brief description and purpose of each type of bushing, together with its most useful application. In-

HIGH SPEED SIDE MILLING CUTTERS

At Cut Prices

Diameters
3″ to 8″

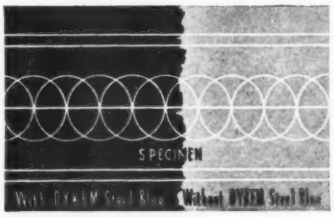
Widths
1/16″ to 1″

Hole
1″ to 1½″

Prices
$4.80 to $39.46

Immediate Delivery

Eastern Tool Supply Co., Inc.
174 Grand St. New York 19, N. Y.



DYKEM STEEL BLUE *STOPS LOSSES*
making dies and templates

Simply brush on, ready for the layout in a few minutes. The dark blue background makes the layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

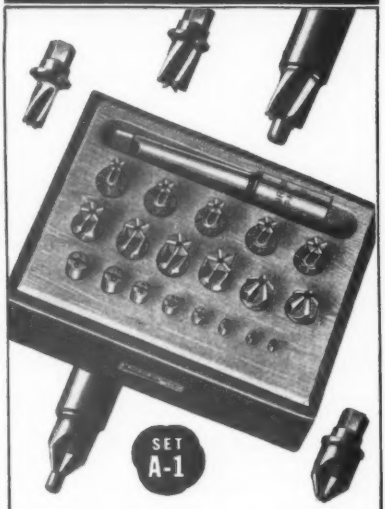
THE DYKEM COMPANY
2303L North 11th Street St. Louis, Mo.

These efficient tool kits speed up your counterboring and spotfacing work, by putting a wide range of cutter and pilot combinations within easy reach. Seven sets from which to choose.

COUNTERBORE SETS

Write for Folder and Prices

THE GAIRING TOOL CO.
Roosevelt Park Box 478, Detroit 32, Mich.



This set includes: one type A-1 holder; nine cutters from ¼″ to ½″; eight pilots from 5/32″ to ⅜″; two ½″ countersinks, one 70° and one 82°, in hardwood box with hinged cover.

GAIRING TOOLS

spected for accuracy of sizes as well as concentricity, which is kept within .0003" full indicator reading, the bushings are carefully heat treated 62 to 64 Rockwell C hardness. Sizes and prices are listed along with sketches. Write to ACCURATE BUSHING CO., Dept. 8-11, 440 North Ave., Garwood, N. J., or use INFORM-A-GRAM Key No. 811-Y.

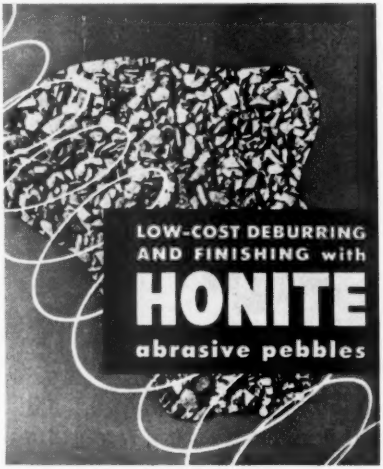
ESPECIALLY SUITED FOR DIRECT INSTALLATION ON INDUSTRIAL FURNACES and plastic moulding machines, a new Veritron electric pyrometric controller has been announced by the Taco West Corp. Many unique features are offered in this two-position instrument including a new electronic circuit, ultra compact design and simplified operation. The design permits the instrument movement to operate a heavy duty relay system without any physical contact or reaction effect on the indicating pointer. Bulletin PC-1 contains detailed data and is available from TACO WEST CORP., Dept. 9, 2620 S. Park Ave., Chicago, Ill., or use INFORM-A-GRAM Key No. L9-Y.

SOLVING UNUSUAL HOLDING PROBLEMS, with special magnetic chucks to hold all types of irregular contours and shapes, is an engineering service of the O. S. Walker Co. A recent catalog No. WPL 47, contains illustrations and specifications of the following types of chucks and equipment: rectangular, swivelling, rotary, special types, demagnetizers and planer parallels. Obtain this catalog on original designing and building of magnetic chucks from O. S. WALKER CO., INC., Dept. 5-11, Worcester 6, Mass., or use INFORM-A-GRAM Key No. 511-Y.

MODERN HIGH PRODUCTION SADDLE TYPE TURRET LATHES, model 1L and 2L, are presented in an unusual publication released by Gisholt Machine Co. entitled "Gus of Gisholt". The news bulletin contains an article on the law's delays, pictures and information about the new lathes, a few cartoons and some fiction in the form of a letter. This copy and others issued during the year are available by writing to GISHOLT MACHINE COMPANY, Dept. 3-03, 1317 E. Washington Ave., Madison 3, Wisconsin, or use INFORM-A-GRAM Key No. 303-Y.

PRODUCTION OF DRILLING, BORING, TAPPING, contour grinding and keyseating operations is increased at lowered costs with Baker machine tools. Applications of special equipment, advantages of their flexibility, basic standard units, heavy construction, long-life multi-spindle heads and other individual features of their standard line of machine tools, along with sketches and photographs, are presented in a two-color application Bulletin No. 2-1947. Ask for copies from BAKER BROTHERS, INC., Dept. 63, P. O. Box 101-Station F, Toledo 10, Ohio, or use INFORM-A-GRAM Key No. A63-Y.

AN ENTIRELY DIFFERENT ABRASIVE TOOL, known as Honite (abrasive pebbles), for tumbling-barrel deburring and finishing of cast, stamped and machined parts, is reviewed in a recent 12-page illustrated publication.



Various types and sizes of Honite and tips on how each is best used in reducing costs on finishing operations are given. This interesting booklet is available from MINNESOTA MINING AND MFG. CO., Advertising Dept., 3-98, St. Paul 6, Minn., or use INFORM-A-GRAM Key No. 398-Y.

A NEW SERIES OF "ALL ELECTRIC" MACHINE TOOLS, built to meet the most exacting requirements of a high speed, heavy production open side planer, has been developed by Cleveland Planer. An eight-page bulletin describes and illustrates important features of detailed parts, an individual belted motor drive arrangement which can be furnished and specifications. Copies may be requested from THE CLEVELAND PLANER, Dept. 12, 3148 Superior Ave., Cleveland 14, Ohio, or use INFORM-A-GRAM Key No. L12-Y.

IMPOSSIBLE SURFACE GRINDING JOBS CAN EASILY BE PERFORMED with a Blitzrev high speed grinder attachment. Readily installed and adjusted to a wide range of positions and because wheels as small as ⅛" diameter may be used, grinding can be done in narrow apertures. Seven quills are furnished to accommodate wheels up to 2½" diameter. Detailed sketches are included in literature available from D & S MODEL CO., Dept. 75, 105-47 S. Robert St., Ludington, Mich., or use INFORM-A-GRAM Key No. H75-Y.

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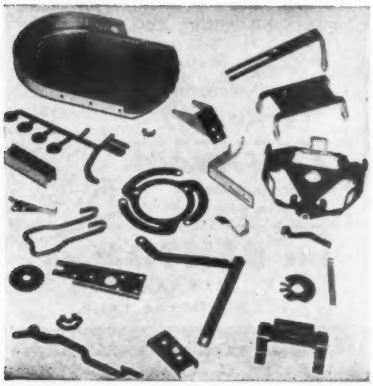

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A NEW 124-PAGE INSTRUCTION MANUAL on descriptive broaching data, plus complete instructions for the installation, operation, servicing and maintenance of all standard LaPoint Broaching Machines, is available from the LaPointe Machine Tool Co. Including detailed tables of specifications, diagrammatic sketches and photographs, this book also devotes sections to hydraulic pumps, the vertical press, and universal broach sharpener. Request a free copy of this book from The LaPointe Machine Tool Co., Dept. X-51, Hudson, Mass., or use INFORM-A-GRAM Key No. 714-Y.

FINER FINISHES WITH A NEW DIAMOND COMPOUND, marketed by Sapphire Products Division, Elgin National Watch Co., are possible through the correction of three fallacies of so-called home-mixed abrasive. A synthetic vehicle has been developed which provides sensibly a permanent dispersion of the diamond particles so that they are kept separate from one another in uniform suspension with no settling out tendencies. Viscosity, rate of breakdown under the heat of abrasive operations, particle size and concentration of diamond, are predetermined and well known, permitting proper correlation on different types of jobs. Detailed information may be obtained from Sapphire Products Division, Elgin National Watch Co., Dept. 89, Aurora, Ill., or use INFORM-A-GRAM Key No. C89-Y.

SELECTION OF DIAMONDS FOR INDUSTRY is facilitated by an eleven-page catalog containing a wide range of applications. A portion of the Diamond Division of New England Carbide Tool Co. is pictured, showing their variety of equipment for the cutting of diamonds by the most modern methods. A representative group of standard and special dressers are discussed and illustrated, as well as the following: boring and turning tools; loose diamonds; superset phonopoints; hardness testers; diamond powder and contact points for various uses. Sketches and data covering machine types for standard dressers are included in this informative catalog. Request copies from Diamond Division of New England Carbide Tool Co., Inc., Dept. 58.5, 60 Brookline St., Cambridge 39, Mass., or use INFORM-A-GRAM Key No. 58.5-Y.

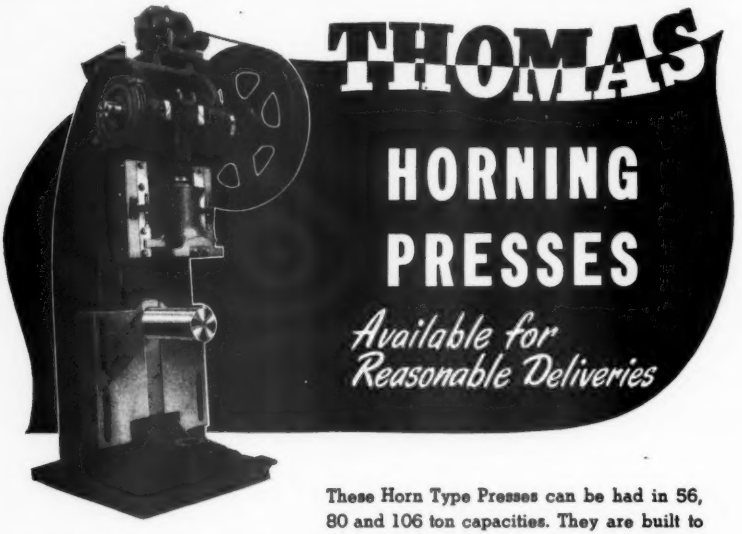
A MASS OF TECHNICAL INFORMATION, concerning 18 of the most widely used aluminum alloys, is presented in easy-to-use form in Reynolds Aluminum Alloy Selector, a slide rule type of chart in standard 8½ x 11-inch size, containing two slides and three windows on each side. By setting one slide for the alloy and the other side for the product, the user has available in handy form data on mechanical properties, chemical composition, physical constants, thermal treatments and specifications. This greatly simplifies selection of the desired alloy and temper for a particular application. In addition, the chart includes an explanation of alloy and temper designations as well as a brief description of outstanding properties of each of the 18 different alloys. Charts are available for $1.00 from Reynolds Metals Co., 2563 S. Third St., Louisville 1, Ky.

"TEN GREAT INVENTIONS" is an interesting booklet published by National Machine Tool Builders' Assoc. Thirty pages, with black and white illustrations, contain simple and direct stories of the early days of the basic machines whose modern counterparts are used today; machines which have made men's work easier, their hours shorter, bringing

higher wages and lower prices. The following ten great inventions are described: the power loom; sewing machine; cotton gin; lathe; freight and passenger carriers; trains; mining machinery; typewriter; linotype; and sheet steel mill. Secure copies of this booklet from National Machine Tool Builders' Association, Dept. 72, 10525 Carnegie Ave., Cleveland 6, Ohio.

ESTIMATING LUMBER NEEDS AND COST can be quickly figured with a Lawrence lumber calculator. It works like a slide rule, one setting instantly calculates the exact number of board feet in any size piece—handles thicknesses from ½" to 12"; widths from 1" to 24" and lengths up to 40 feet. Made of well-seasoned wood, carefully machined and finished with a soil-proof white face, the guide is plainly calibrated in inches and feet, with legible and accurate graduations. The entire back of the rule provides space for an advertising message. Orders for individual rules $0.50, three for $1.00; available in quantities for advertising purposes. Write for quotations of free catalog illustrating complete line of Lawrence slide rules and special calculators to Lawrence Engineering Service, Dept. 10, 70 Blake St., Peru, Indiana.

"LIST OF A.S.T.M. STANDARDS" issued annually and tentative as of December 1946, are compiled in a catalog form. They appear under the following four subdivisions: ferrous metals, non-ferrous metals, non-metallic materials—constructional, and non-metallic materials—general. Standards in each classification are grouped according to the materials to which they apply, each group being subdivided according to specification, methods of test, recommended practices, and definitions. Each specification, test, etc., is included in the Book of Standards, and each is available in separate pamphlet form. Address inquiries to American Society for Testing Materials, Dept. 3, 1916 Race St., Philadelphia 3, Pa.



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P-4

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Anyone can operate a Dahlstrom Tap Guide. Just fasten it to a post, slip a Tap Adaptor into the spindle and turn the handle. Cuts tap breakage down to zero. $52.50 F. O. B. Minneapolis, including 7 Adaptors. At mill supply houses, or Dahlstrom Mfg. Co., 422 South 6th St., Minneapolis 15, Minn. ASK FOR CIRCULAR.

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The "Unbrako" Socket Head Cap Screw with the Knurled Head saves assembly time, facilitates compact designs, reduces weight and cost. The Knurling provides a slip- and fumble-proof grip—even though the fingers and heads be ever so oily—therefore, it can be screwed-in faster and farther before it becomes necessary to use a wrench. The "Unbrako" Socket Cap Screw may also be a Self-Locker—ask us how.

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TDJ SHOP DATA SHEET NO. 63

Comparison Chart of Cemented Carbide Grades

Material	Cast Iron, Nonferrous and Nonmetallic Materials			Steel and Steel Alloys		
	Very hard and abrasion resistant for light finishing cuts to close tolerances and fine boring	Tough, high shock and very good wear resistance for production machining to close limits	Very rough carbide suitable for heavy duty medium speeds and feeds; applicable for hogging and finishing operations. Will withstand shock and jump cuts. Suited for inexperienced users	Exceptionally hard and abrasion resistant for high speed finishing cuts at close tolerances. Less shock resistant than other grades	Wear resistant and tough. General purpose applications for all types of steel. Light intermittent cuts	Very tough, shock and crater resistant, suitable for slow speeds and deep cuts; for large steel pieces; withstands severe interrupted cuts
Rockwell Hardness on "A" Scale	**92.4**	**91.5**	**90.3**	**92.5**	**91.5**	**90.8**
Adamas	**AA**	**A**	**B**	**CC**	**C**	**D**
Carboloy	**905** 999	**883**	**44A** 907	**831**	**78**	**78C** 78B
Carmet	**CA8** CA7	**CA4** CA9	**CA3**	**CA6**	**CA2**	**CA1** CA5 CA10
Firthite	**HF**	**HA**	**HC** H	**T16** T13	**TA**	**T04** T89
Kennametal	**K6**	**K6** K4H	**K2S**	**K4H**	**K3H**	**KM** K25
Malta		**MF**			**SF**	**CR**
Talide	**C-91**	**C-91**	**C-89**	**S-92**	**S-90**	**S-88**
Teco	**469** A-1	**A-1**	**A** **B**	**CF**	**C**	**C** **CHD** CM9
Vascoloy Ramet	**2A9**	**2A5** A 2A7	**2A68** 2A3	**E** B	**E** A X	**EM** EE
Willey's Metal		**E5**	**E6**	**509**		**710**

Bold Face Type indicates best comparison.

"The Adamas Carbide Corp. makes no representation as to the quality, price or composition of the products listed except in respect to those physical and chemical characteristics which can readily be measured by objective scientific tests."

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MERZ Pneumatic Taper Gages perform *both* these vital inspection functions in *one* operation. MERZ Taper Gages consist of two MERZ Air Gages, plus a special fixture equipped with large and small hard steel taper-gaging rings. One air gage registers taper variations to plus or minus 30', in graduations of 5'. (Also available for totals of plus or minus 10' in graduations of 1'). Out-of-round conditions up to .002 are registered simultaneously on the second gage in increments of .0001. Write for complete information.

MERZ also manufactures a standard line of air gages in five models, as well as standard A.G.D. and special gages.

MERZ Engineering Company
INDIANAPOLIS 7, INDIANA

Cold Extrusion

(CONTINUED FROM PAGE 71)

many it was vital, regardless of cost factors, because of the critical shortage of good steel.

Work now in progress in the United States will give the first real information on which to base estimates of cold extrusion costs under American conditions. How widely it may be adopted will probably be determined only after several manufacturers have put it to practical use.

The National Research Committee of the Pressed Metal Institute has made some preliminary comments on the Galbreath report, urging careful study of the economics of any particular job. The committee points out the chief limitation of the method: the cross-section of the cylinder is uniform; the walls cannot taper or bulge. Yet it is possible, they say, that American manufacturers may develop variations of the method which will make it even more versatile.

The committee is more positive about the usefulness of bonderizing and points out one factor which commends it to the American manufacturer: the fact that hot-rolled steel is lower in price than cold-rolled, fully annealed steel. By bonderizing after the first operation, the committee suggests, a manufacturer may be able to use hot-rolled steel for jobs in which the more expensive cold-rolled steel is now used. Bonderizing is necessary because of the polished surface produced on hot-rolled material in drawing operations.

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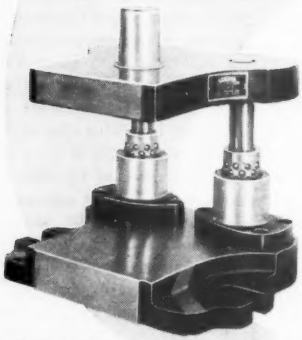

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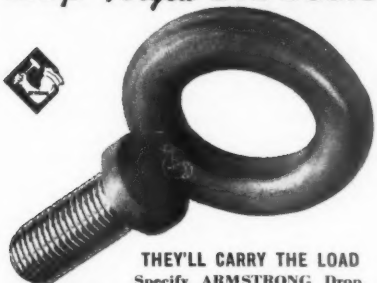
Drop Forged EYE BOLTS



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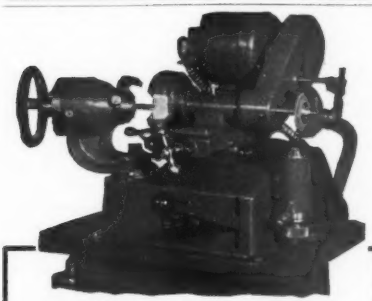

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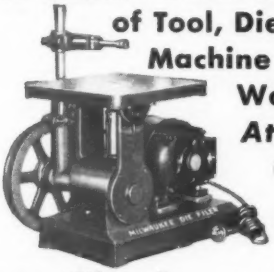

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Shop Talk On Quality Control

(CONTINUED FROM PAGE 74)

This establishes that the upper Range Limit is .0010" and the lower Range Limit is 0.000".

Next, to find the Upper and Lower Control Limits we use the equation:

$\overline{\overline{X}}$ plus or minus $A_2\overline{R}$ or

Upper Control Limit = $\overline{\overline{X}}$ plus $A_2\overline{R}$ and

Lower Control Limit = $\overline{\overline{X}}$ minus $A_2\overline{R}$.

We know that $\overline{R}$ is .0005 and that the value of $\overline{\overline{X}}$ is .8753. What is the value of A_2? Again we have to refer to a table of established values or constants. The values for A_2 also vary according to the size of the lots sampled or inspected. The table shows us that:

Sample Size	A_2
5	.577
8	.373
10	.308
12	.266
15	.223

The Upper Control Limit, for our sample of five measurements, Figure 6, is therefore:

$.8753 + (.577 \times .005) = .8753 + .0002 = .8755$

And the Lower Control Limit becomes:

$.8753 - (.577 \times .0005) = .8753 - .0002 = .8751$

We have now found the edges of the paved road or those Upper and Lower Control Limits defining the area in which safe operation may be assured. The Control Chart is now placed on the grinder, Figure 7, and the operator, Joe Doakes, watches the averages being plotted by the inspector and is warned when he is getting too close to the ditch.

The reader notes the upper and lower control limits established at .8755" and .8751", mentally compares them to the upper and lower tolerances, and says to himself, "How come?"

It will be remembered that the writer explained that the science of Quality Control accurately portrays a picture of the particular operation on a particular machine. This placing of the Control Limit area toward the lower tolerance line, where the upper control limit is the mean tolerance, indicates a *definite trend.* The Quality Control inspector, after tabulating the control limits and observing that the Range spreads over the total plus or minus tolerance spread of .001", immediately checked his calculations and went back to the grinder to observe the operation.

It seems that the operator continually neglects to let the work "spark out". Grinder operators will recognize the term. However, to the uninitiated the term means that the work feed into the grinding wheel is stopped and the work is left revolving with no pressure being exerted against the grinding wheel. Definite close tolerance sizing and "rounding up" is accomplished by the "spark out" technique.

The operator's forgetfulness or sloppy technique has been indicated by the Quality Control Chart. It definitely shows a trend toward letting his work come off the grinder without "sparking out" and therefore his work plays along the high tolerance limit. To hold the operator in line, the Control Chart holds him to the low limit until he learns to let his machine "spark out". When he gets into line, a new Work Sheet will be prepared and the upper and lower control limits shifted to better accommodate the tolerance spread. However, the Control Chart will continue to indicate the actual situation at the machine from actual recorded data, not arbitrary data. The control limits are not shifted unless the operation definitely shows that the picture has changed.

After the first shift operator "settles down" and a Work Sheet and Control Limits are established for the second shift operator, a Control Chart is established for the job and the limits and ranges established are considered STANDARD VALUES.

These STANDARD VALUES are considered much in the same manner as are Time Study Standards; they are not changed unless the operation or method changes. Any future operator must control his work between these Standard Upper and Lower Control Limits. If erratic values for $\overline{\overline{X}}$ or $\overline{R}$ should show

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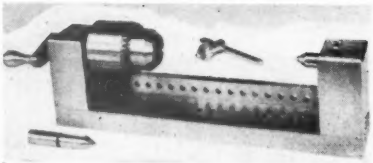

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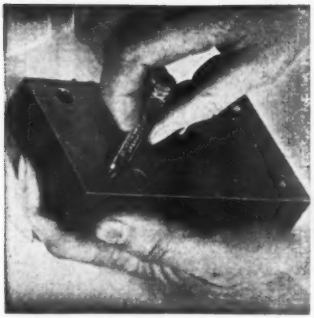

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Number of Instruments	3	4	6
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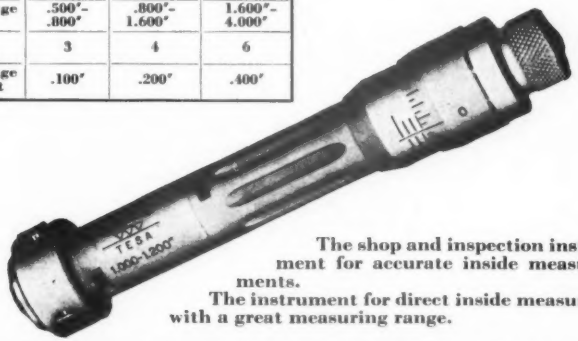

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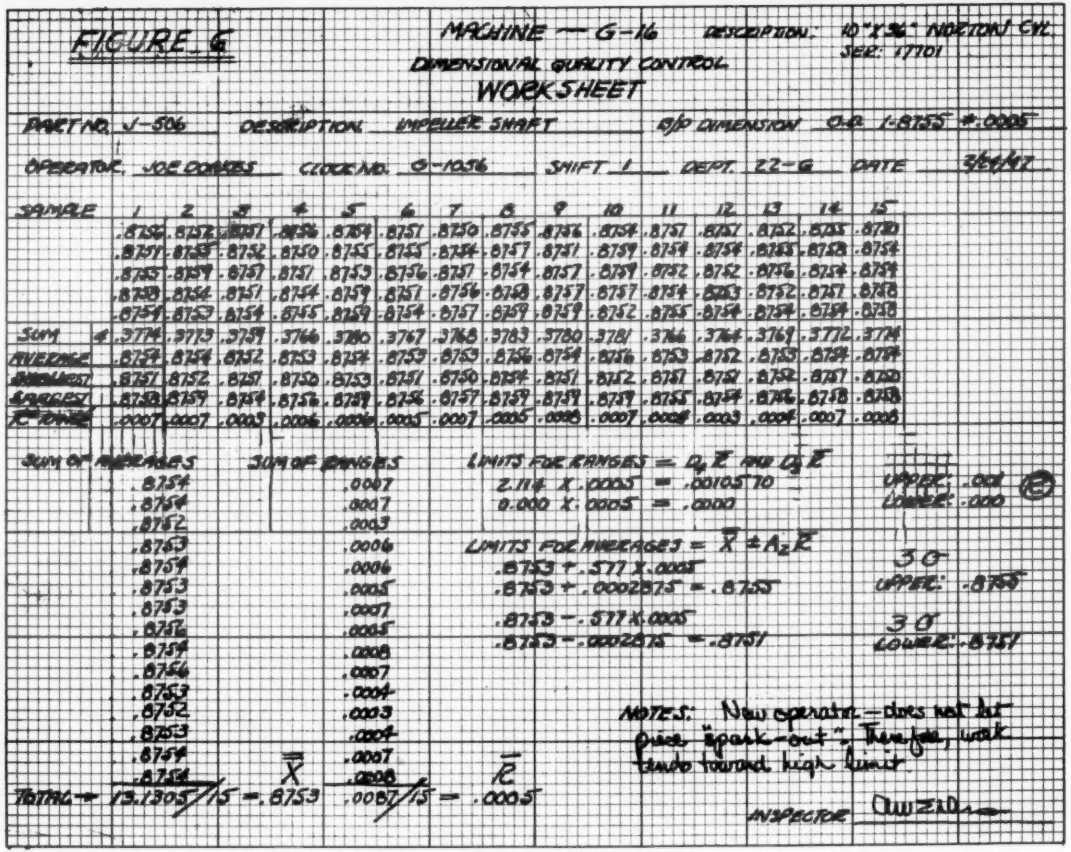


FIGURE 6

MACHINE — G-16 DESCRIPTION: 10"X36" NORTON CYL. SEQ: 17701

DIMENSIONAL QUALITY CONTROL

WORK SHEET

PART NO. J-506 DESCRIPTION: IMPELLER SHAFT O/D DIMENSION O.D. 1.8755" ±.0005"

OPERATOR: JOE COMBES CLOCK NO. G-1056 SHIFT 1 DEPT. 22-G DATE 3/6/67

SAMPLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	.8756	.8752	.8751	.8756	.8754	.8751	.8750	.8755	.8756	.8754	.8751	.8751	.8752	.8755	.8750
	.8751	.8753	.8752	.8750	.8755	.8755	.8754	.8757	.8751	.8759	.8754	.8754	.8755	.8758	.8754
	.8755	.8754	.8751	.8757	.8753	.8756	.8757	.8754	.8757	.8759	.8752	.8752	.8756	.8754	.8754
	.8750	.8756	.8751	.8754	.8759	.8751	.8756	.8758	.8757	.8757	.8754	.8753	.8752	.8757	.8758
	.8754	.8753	.8754	.8755	.8759	.8754	.8757	.8759	.8759	.8752	.8755	.8754	.8754	.8754	.8758
SUM 4	3774	3773	3759	3766	3780	3767	3768	3783	3780	3781	3766	3764	3769	3772	3774
AVERAGE	.8754	.8754	.8752	.8753	.8754	.8753	.8753	.8756	.8754	.8756	.8753	.8752	.8753	.8754	.8754
SMALLEST	.8751	.8752	.8751	.8750	.8753	.8751	.8750	.8754	.8751	.8752	.8751	.8751	.8752	.8757	.8750
LARGEST	.8758	.8759	.8754	.8756	.8759	.8756	.8757	.8759	.8759	.8759	.8755	.8754	.8756	.8758	.8758
R̄ RANGE	.0007	.0007	.0003	.0006	.0006	.0005	.0007	.0005	.0006	.0007	.0004	.0003	.0004	.0007	.0008

SUM OF AVERAGES: .8754, .8754, .8752, .8753, .8754, .8753, .8753, .8753, .8752, .8753, .8754, .8754

TOTAL = 13.1305 / 15 = .8753 = X̄

SUM OF RANGES: .0007, .0007, .0003, .0006, .0006, .0005, .0007, .0005, .0006, .0007, .0004, .0003, .0004, .0007, .0008

TOTAL = .0087 / 15 = .0005 = R̄

LIMITS FOR RANGES = $D_4\bar{R}$ AND $D_3\bar{R}$

2.114 X .0005 = .00105 TO

0.000 X .0005 = .0000

UPPER: .001

LOWER: .000

LIMITS FOR AVERAGES = $\bar{X} \pm A_2\bar{R}$

.8753 + .577 X .0005

.8753 + .0002885 = .8755

3σ UPPER: .8755

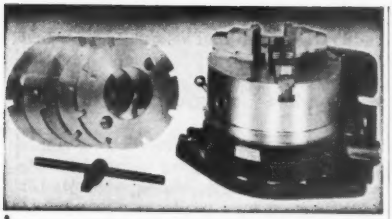
.8753 − .577 X .0005

.8753 − .0002885 = .8751

3σ LOWER: .8751

NOTES: New operator — does not let piece "spark-out". Therefore, work tends toward high limit.

INSPECTOR: Quizid



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up due to machine conditions the job should be shut down until the machine is repaired.

Shop men and time study men will recognize the fact that some jobs *continue* to "settle down". In most cases the reason for this continued settling is because the operation is new to the shop, or the machine is far more accurate than inexperienced first attempts at its operation indicate. Control Charts and Time Studies set during the learning period sometimes show variables that need correction. The Control Chart Limits are often too restricting and the piece work rates are too loose. Also, the machine is often too accurate for the work placed upon it.

To illustrate the previous paragraph let's refer to Figure 6. If $\overline{\overline{X}}$, or the average, approaches closely the mean tolerance, and $\overline{R}$, or the range, settles down, the previously established control limits may be too constricting for practical shop production when tool or grinding wheel wear has to be considered. If $\overline{\overline{X}}$ becomes .8755″ and the range settles down to .0003″, then by using the formula or equation $\overline{\overline{X}} \pm A_2\overline{R}$ the upper control limit becomes .8757″ and the lower control limit becomes .8753″. As the machine consistently produces pieces within a range of .0003″ and the total tolerance range is .0010″, why restrict the operation to a range of .0004″?

When we encounter such a condition as this, Quality Control recognizes the situation and uses another method of establishing the upper and lower control limits.

A new term, .71 $\overline{R}$, now enters the picture. Using the figures in the example where $\overline{R}$ = .0003″ and the upper and lower tolerances are .8760″ and .8750″ respectively, we subtract .71 $\overline{R}$ from the upper tolerance and add .71 $\overline{R}$ to the lower tolerance to establish the upper and lower control limits. Thus we have:

.71 $\overline{R}$ = .71 x .0003″ = .000213″ from which

Upper Control Limit = .8760″ + .0002″ = .8758″

Lower Control Limit = .8750″ − .0002″ = .8752″

This widened safety zone permits the gradual wear of tool or grinding wheel consistent with practical shop operation and does not constrict the operation too closely when the machine is overly capable.

Do not use the .71 $\overline{R}$ method of establishing upper and lower control limits *unless* the machine is *too capable* for the job, or the average readings approach or equal the mean tolerance and the range or spread is less than ⅔ the total tolerance spread.

The term .71 $\overline{R}$ is derived from the following equation:

$A_2 \overline{R} (\sqrt{N} - 1)$

N = No. of samples

$.577 \overline{R} (\sqrt{5} - 1) = .577 \overline{R} (2.236 - 1)$

$= .577 \overline{R} (1.236) = .71 \overline{R}$

Had we used eight samples or observations instead of the five shown in Figure 6, we could not strictly use .71 $\overline{R}$, as the constant .577 would change to .373 according to the previous table of values for A_2.

Therefore, $A_2\overline{R} (\sqrt{N} - 1)$ would indicate:

$.373 \overline{R} (\sqrt{B} - 1 = .373 \overline{R} (2.828 - 1)$

$.373 \overline{R} (1.828) = .68 \overline{R}$

However, the upper and lower control limits would not change for practical purposes as the change would be in the fifth decimal place as:

$.8750 + (.68 \times .0003) = .8750 + .000204$

$= .875204$

$.8760 - (.68 \times .0003) = .8760 - .000204$

$= .875796$

The few simple tools necessary to start Quality Control in the average shop are now in the possession of the reader if the writer has done a workmanlike job in attempting to explain them. To those who are well versed in Quality Control this article may seem elementary and trite. However, it's like the ten cent store hammer, "it ain't elegant, but it will drive nails after a fashion." The best way to start learning how to drive nails is to start!

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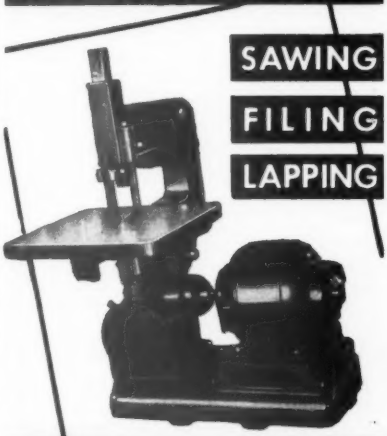

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in putting a new idea or technique into practice. Some individuals and companies prepare elaborate and detailed instruction sheets. All personnel are briefed as before a desperate bombing raid. The entire program is definitely planned to the last detail. All conceivable exceptions are blocked and answered beforehand.

This approach is excellent if the personnel is available and, once started, progresses very smoothly. However, in most shops no such elaborate planning can be accomplished because some already overworked individual, such as the plant inspector, must shepherd the program through, along with his other duties. This approach can work if the shop cooperates and if the shop understands just what is being done and just what is to be accomplished.

A good plan is to select an operation requiring close tolerances and where production is of a good volume run. Then select a critical dimension; one that has required careful checking and one that is causing scrap.

Take the operators and the foreman into complete confidence. Explain the whole scheme and solicit their assistance. A good blackboard session is very helpful in showing them the various phases of Quality Control A, B, C's.

If possible cite some "before and after" examples which can be had in many back issues of the publication "Industrial Quality Control" published by the American Society For Quality Control. Also, "before and after" examples can be collected from plants in your vicinity where Quality Control has become a valued tool.

Convince the shop that Quality Control is not a pet theory in an experimental stage. Convince the shop that the mathematics and tabulation involved are very incidental and can be accomplished by any clerk, male or female, after it becomes routine. Convince them that the shop itself holds the key to the real issue.

The real issue in Quality Control application is to develop men who can "read" into the charts, graphs and tabulations the *reason* and *cure* for the fluctuating curves.

The operators themselves, once they become interested, often supply the correct diagnosis why certain tools, slides and holders contribute to the limits and ranges.

"Cause and Effect" determined by Quality Control technique is of invaluable assistance in Process Engineering, Tool Design, etc. Quality Control, correctly used and interpreted, will ofttimes provide the necessary preventive or vaccine against many processing ills. However, a detailed X-ray of a patient's chest is of little value unless it can be correctly interpreted.

You will be pleasantly surprised some day when the turret-lathe operator calls you over to his machine and says, "I think I know what causes the high range on part J-305. It's the recessing tool holder; watch that tool shank when I index around next time." When you have this unsolicited interest on the part of the first operator in your shop, you have put Quality Control over! Sloppy, disinterested operator performance continually dependent upon the crutch of 100% Final Inspection changes overnight to a state of precise and interested operation with operators intent on "being on the ball".

Many hard-to-diagnose production aches and pains are directly related to the war born, "let 'em roll, 100% final will catch all the scrap".

The writer concludes with this thought: Quality Control is essentially common sense applied by means of a few symbols and constants to your everyday production problems. Quality Control is a simple and effective production tool that any shop can use once the A, B, C's of the program are fully understood and appreciated. The refinements necessary to master the balance of the alphabet will come naturally.

Anyone who wishes to continue in the study of Statistical Control can do so with a few plainly written textbooks which can be mastered in the armchair fastness of his living room. However, the real education comes from practical experience in the shop; you can't acquire the real feel of a trade from a textbook. You have to start "doing" for yourself.

(This is the last in a series of two articles by Contributing Editor Ehlers. Part I appeared in May 1947.)

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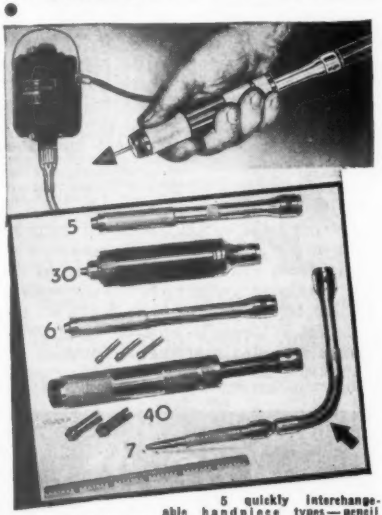

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A Tooling Program

(CONTINUED FROM PAGE 83)

holder mounted in the third position of the turret advances to reduce the diameter of the stock to .370" for an additional length of $1\frac{13}{32}$" as shown at C, Figure 55. The valve stem is a functional part of the valve and requires a surface quality of 20 microinches. By using a box tool with a "V" back rest, a smooth surface can be developed without later grinding, since the rubbing action of the work against the "V" back rest burnishes the surface.

Turret indexes to fourth position: Dwells.

During the turret dwell, a circular form tool, G, Figure 55, mounted on the front cross-slide, advances to cut a retaining collar .121" wide with a diameter of .556" and to make an undercut $\frac{1}{16}$" wide to a diameter of .360". It is specified that the surfaces of the collar be flat and perpendicular to the center line, with a maximum radius of .015" on the edges. As this forming cut is completed, a $\frac{5}{16}$"—24, Class 3 threading die, with die holder set up in the fourth position of the turret, moves in to cut threads on the end. The shape of the workpiece after these operations is shown at D, Figure 55.

Turret indexes to fifth position.

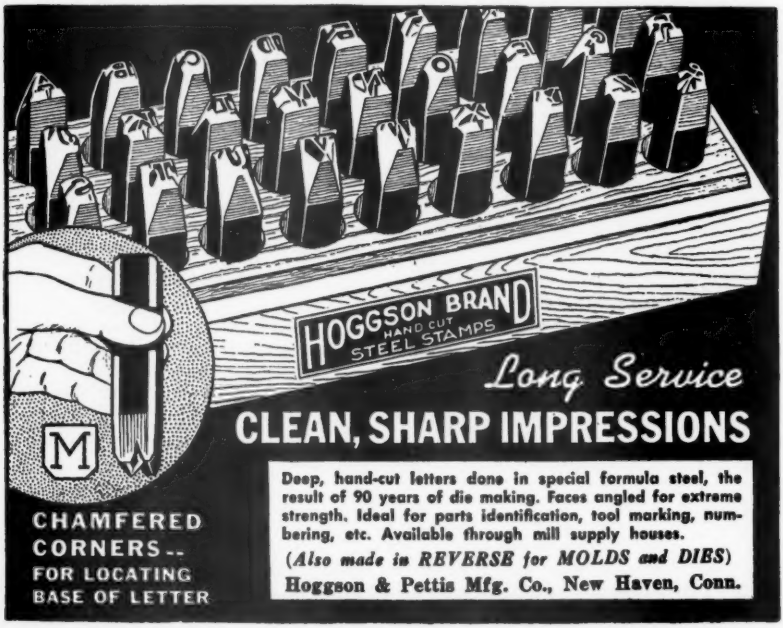
A chamfering tool set in a knee type turning tool holder and mounted in the fifth position of the turret advances to chamfer the threaded end to 45° on a ¼" diameter, E, Figure 55.

Turret indexes to sixth position.

Stock feeds out to final length.

A ⅛" wide cut-off tool in the rear cross-slide moves in to cut off the valve stem after it has been fed out to final length. The shape of the workpiece after the completion of this Brown & Sharpe cycle of operations is shown at F, Figure 55.

(TO BE CONTINUED)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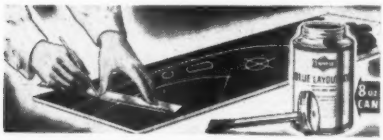

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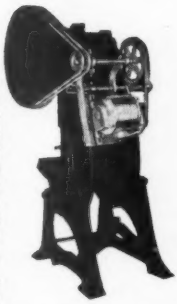

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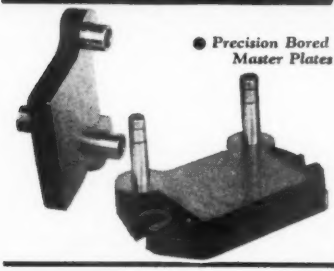

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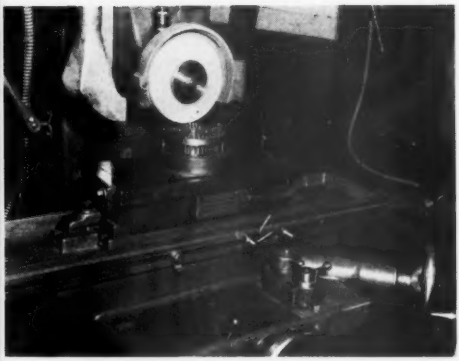

Carborundum Introduces New "Series 20"

A new type of ceramic or vitrified bonded grinding wheel has resulted from a several-year development program by the technical laboratories of The Carborundum Company, Niagara Falls, N. Y.

The objectives of modern abrasive engineering are the reduction of those factors that interfere with cutting action and the enhancement of the factors that contribute to higher cutting efficiency. To this end, the new Carborundum "Series 20" wheel has passed successfully a long period of tests. The wheel is constituted of a new blend of abrasive grains combined in radically different structural relations with a new type of bond.

The accompanying illustrations are indicative of applications now being made of the new wheel. An important contribution to user convenience has resulted from extensive field testing which has determined that a narrow selection of grits and grades will cover a wide range of operations.

For your convenience in obtaining full, detailed specifications and recommendations regarding the new "Series 20" wheels, use our postage-free INFORM-A-GRAM Key No. A10-Y.

Fig. 7. A re-sharpening setup using the new "Series 20" cup wheel on a 12" face milling cutter.

Fig. 1. This grinding operation on a lamination die involved a severe interrupted cut. The cut was taken at a table traverse of 35 fpm with a .010" depth of cut.

Fig. 5. A cylindrical grinding operation on a chrome plated plug gage.

Fig. 2. An application of grinding 90 unhardened punches. Depth of cut .010".

Fig. 3. The new Carborundum "Series 20" taking a .020" depth of cut on a cast iron machine part.

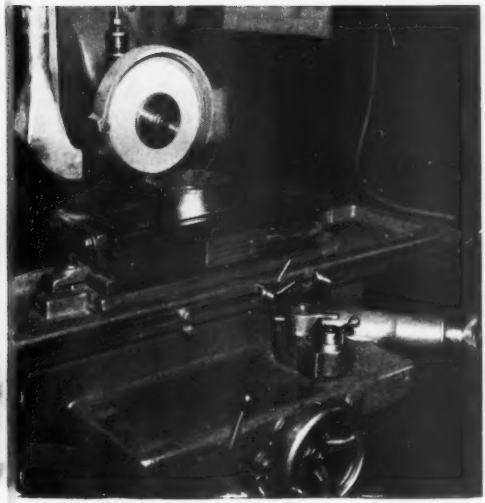

Fig. 4. Grinding a high carbon, high chrome steel blanking die. Depth of cut .010".

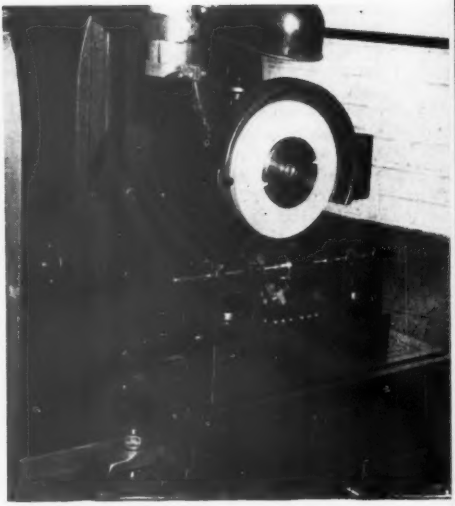

Fig. 6. A finish form grinding operation on a high speed steel form with a "Series 20" wheel.

Injection Machine Molds Rubber

A revolutionary machine for production molding of both natural and synthetic rubber, the H-P-M Turbojector, injects rubber into a hydraulically clamped mold, by means of a motor driven screw. Typical examples of a wide variety of parts which have been molded are "O" ring gaskets, rubber bushings and automobile motor mountings. Outstanding results were obtained in each instance. The "O" ring gaskets were symmetrically molded without flash, and with greatly improved tensile strength. Automobile motor mountings were molded with better adhesion of the rubber to the metal plates than could be obtained by any previous method. The rubber bushings, requiring large moldings and an injection capacity of 2½ lbs., were cured in 1½ min., compared with approximately 20 min. required by conventional methods.

Actual production results have proven that rubber parts, molded with the H-P-M Turbojector, have superior physical properties as compared to those molded by conventional compression methods. Production costs have been greatly decreased. For example, preforms are eliminated; curing time has been substantially reduced, in some cases as much as 93 percent. Due to the elimination of flash, finishing operations have also been reduced to a minimum.

The rubber in strip, pellets, ribbon or rod form is fed into the injection cylinder by the feed screw. As the rubber advances, the feed screw meshes with a set of specially designed, free running baffle gears, which act as pressure locks. The action of the screw and baffle gears forces the rubber into the nozzle. Frictional heat produced in the injection chamber raises the temperature of the rubber as high as 300° F. Additional heat is secured at the nozzle by employing an electrical resistance band heater. This pre-heating accounts for the rapid curing cycles which can be obtained with the H-P-M Turbojector.

Maximum nozzle contact pressure during injection is approximately 6,000 pounds, permitting injection pressures as high as 18,000 psi on molding material. The entire injection unit pivots on a stationary mold clamp platen and hydraulically tilts, permitting the nozzle to engage the mold only during injection. To facilitate changing of molds, the injection head can be hydraulically tilted clear of the mold space.

Another outstanding feature of the Turbojector is its large capacity. Experimentally the machine has molded up to 8 pounds of rubber per "shot". Production results to date have proven so successful that the H-P-M Turbojector is now being employed experimentally in several large rubber molding plants. Results have proven that this machine definitely overcomes many of the handicaps of conventional compression molding, in all cases has greatly reduced the over-all molding cycle.

The entire machine cycle is automatic. The H-P-M Turbojector is a completely self-contained unit, the machine base containing the H-P-M pumps and valves for controlling all hydraulic actions. The only connections required to put the machine in operation are electric power and cooling water.

For available literature on the H-P-M Turbojector, write The Hydraulic Press Manufacturing Company, Dept. 3-28, Mount Gilead, Ohio, or use our postage-free INFORM-A-GRAM Key No. 328-Y.

Patent No. 2408503

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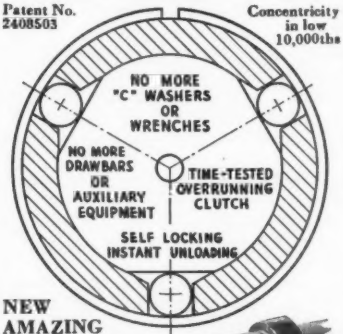
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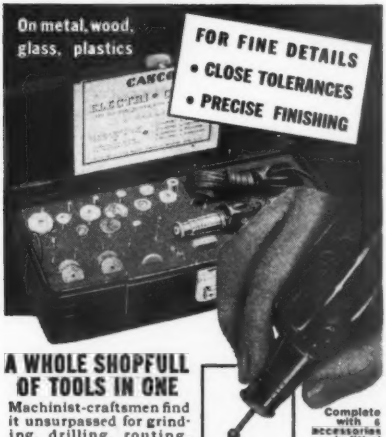

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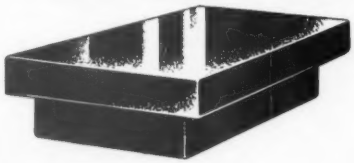

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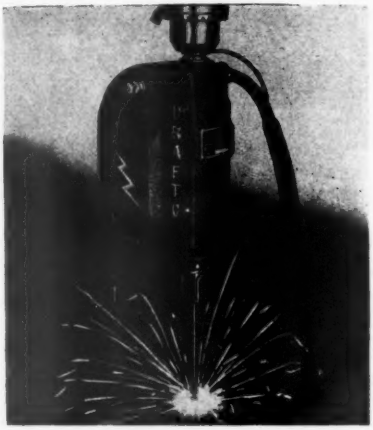

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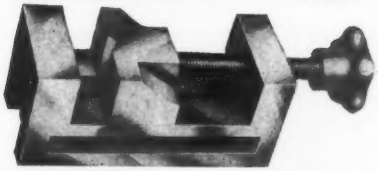

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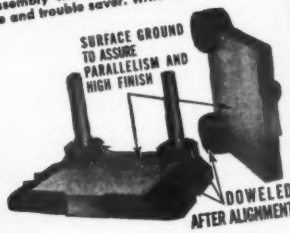

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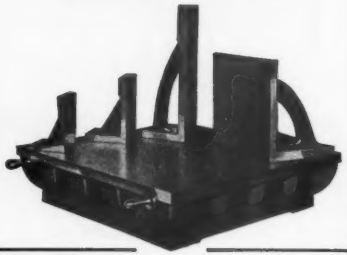

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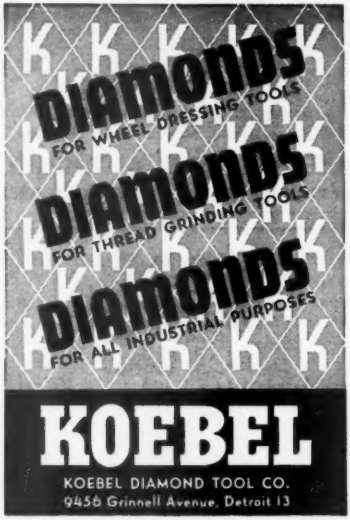

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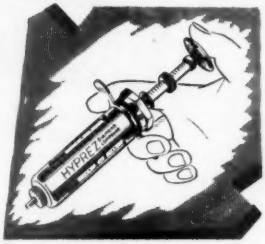

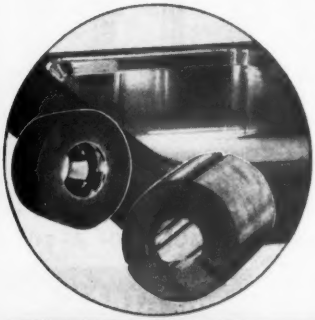

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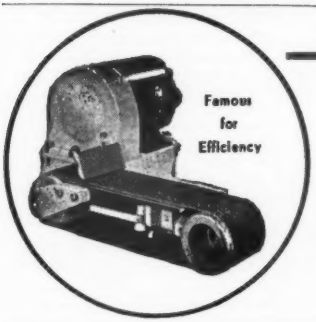

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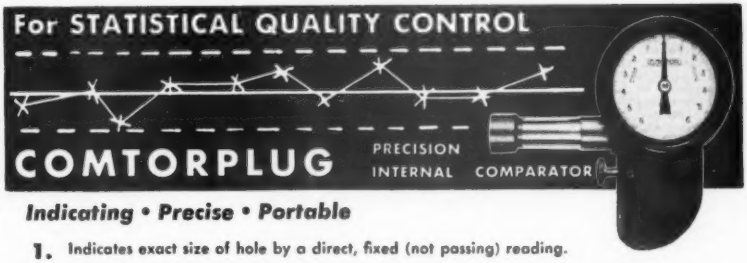

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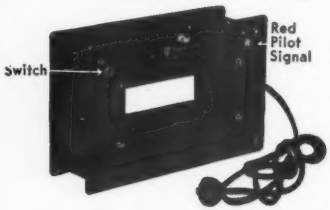

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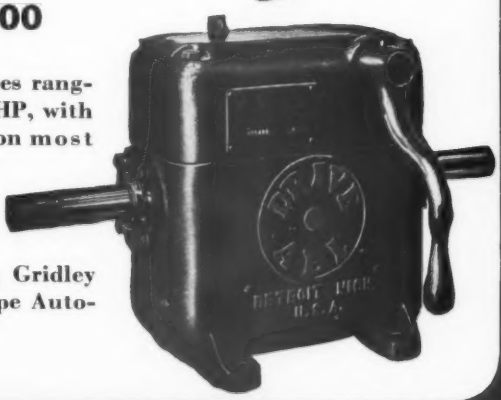

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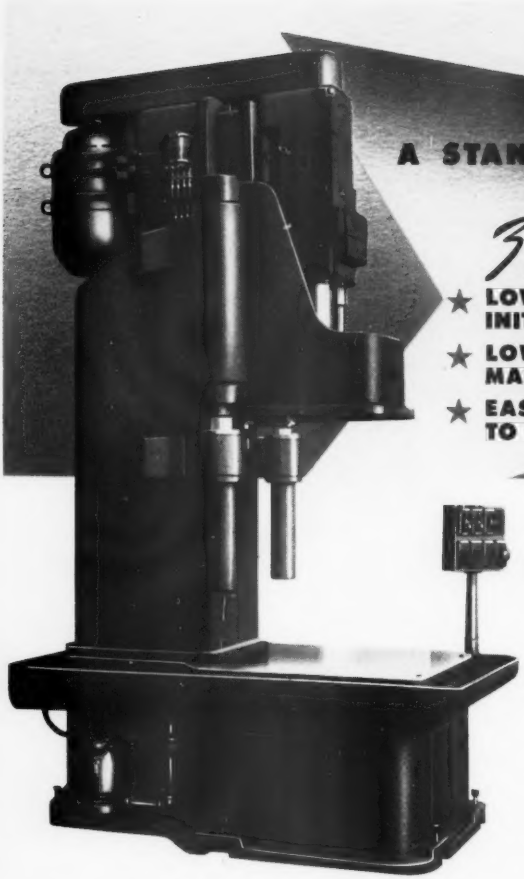

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